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THE JOURNAL OF APPLIED PSYCHOLOGY

JAMES P. PORTER, *Editor*
OHIO UNIVERSITY ATHENS, OHIO
With a Board of Cooperating Editors

SOME INTERESTING CONTRIBUTIONS IN THIS ISSUE:

- C. M. LOUTTIT. A Blank for History Taking in Psychological Clinics
- LEONARD W. FERGUSON. Preferred Positions of Advertisements in the *Saturday Evening Post*
- S. R. HATHAWAY and A. C. WELCH. Does Guessing Distort the Results of the Method of Triple Associates?
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The Journal of Applied Psychology

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Edited by

James P. Porter, Ohio University
Athens, Ohio

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A BLANK FOR HISTORY TAKING IN PSYCHOLOGICAL CLINICS[1]

C. M. LOUTTIT
Director, Psychological Clinics, Indiana University

THE question whether or not it is valuable to record a detailed personal, family and social history of the child referred to a clinic has been definitely answered in the affirmative. During the past quarter of a century the literature of clinical psychology and child guidance contains a number of suggested blank forms for the recording of such histories. Very few of these have been published in an independent form available for public use. The purpose of this paper is to present arguments for and against the use of such forms and to describe briefly the folder in use at present in the Indiana University Psychological Clinics.

ARGUMENTS AGAINST PRINTED FORMS

1. The strongest argument against the use of printed forms is that the examiner is apt to feel restricted to the items appearing thereon. Thus is imposed a standardization without sufficient flexibility to allow for variation from case to case.

2. From this follows a second criticism: that a printed form is not suitable for special cases. Some children present problems concerning which desirable information is not asked for on the blank.

3. On the other hand, it is argued that for many cases there is too much information asked for.

4. Therefore, the claim is made that using blanks that are not going to be filled out completely means an unnecessary expense.

ARGUMENTS FOR A PRINTED FORM

Essentially, the arguments in favor of using a printed form are answers to the previously stated objections.

1. If a printed form is considered primarily as a guide to history

[1]Publications of the Indiana University Psychological Clinics Series II, No. 11.

taking, there is no need to feel restricted. Omission from and additions to, the blank must be made in light of each immediate situation.

2. An adequate form will make allowance for additional information required in special cases.

3. For "routine" cases for which a great deal of information is not desired under the operating procedure of certain clinics, there still remains a basic minimum of data that good policy would require.

4. Both the second and third of these may be taken care of by careful organization of the form. Basic data may be entered item by item while that less definite data that varies from case to case may be allowed for by sufficient blank space. With such an organization, a printed form may be made inexpensively, and over a period of years will prove economical in follow-up, continuation of cases, and utilization of information for research.

5. This introduces what is probably as important a reason for the use of a printed form as any. The clinic records are more uniform and more easily available for many purposes even years after a case is closed.

THE INDIANA PSYCHODIAGNOSTIC BLANK [2]

At the Indiana University Psychological Clinics a blank has been developed which has proved satisfactory after nearly two years of use. This form is a twelve-page pamphlet with an 8½ x 11 inch page size. Each page is reproduced in order on pages 741-748. There are ten sections, each concerned with a special part of the desired history.

Section I, Identification. The upper half of the first page is arranged for the usual data required for identification of the child. Space is also provided for a brief statement of the problem or the reasons for referring. This may be entirely different from the real problem found after examination.

[2] These Blanks may be secured from the Department of Psychology, Indiana University, Bloomington, Indiana, at four cents each with a discount on quantities. This reproduction of the Blank does not show the actual space provided for filling in a complete record of the findings. There are twelve pages in all.

Section II, Summary. The lower half of the first page is to be used for a statement of conclusions including diagnosis and prognosis and for recommendations made. Thus, the first page serves as a face sheet giving a very brief summary of the case.

Section III, Developmental history. In this section there are seven divisions including data on pregnancy conditions, birth and infancy, and summaries of sex, health, educational and vocational history. Certain data are specifically mentioned and require a brief statement; for other questions e.g., in health history, attitudes at school, etc., space is left for a more extended answer because these are things that vary a good deal from case to case.

Section IV, Parents and Family. Certain definite information regarding the father and mother is asked for and space is allowed for extra remarks. The parental attitudes, siblings, grandparents and collaterals are all entered as headings with space for comments under these various headings.

Section V, Home. Certain important data regarding the physical conditions of the home are treated specifically. Further entries regarding the home as well as the neighborhood and the psycho-social condition within the home may be entered in an informal manner to suit the specific case.

Section VI, Child's behavior. Rather than list behavior or personality traits to be rated or checked, we find it more satisfactory to leave a blank page on which are written accounts of the child's behavior given by various informants or by the child himself. We use this page for notes regarding the case not elsewhere provided for.

Section VII, Test performance. These pages have been so arranged that we find it unnecessary to use any other blank forms for recording test performance results. Our usual routine testing uses a form of the Binet, the Porteus maze and one or more formboards. Each of these has been fully provided for. The Roman numerals under "Binet" and "Porteus Maze" represent year groups and under "Binet" the row of Arabic numerals are for items within the year group. Pluses and minuses placed in the squares show the child's performance at a glance, while the

score may be summarized in the last column. Responses to Binet or other questions, or comments on maze or formboard performances may be written on the lower half of the page. Results on tests from pre-school scales, and aptitude, personality and other test results are entered on the following page. All test performances are summarized in the table in the upper right hand corner headed "Summary." On the lower half of the second page space is left for a description of the child's attitude toward the test and special notes on interpretation.

Section VIII, Physical examination. Except for the formal anthropometric data, the spaces for the various sections have been left blank for the convenience of the physician making the examination. It is our practice to have this part of the blank filled in only by a physician.

Section IX, Delinquency and *Section X, Speech defects* are included for certain formal data concerning these particular groups.

INDIANA PSYCHODIAGNOSTIC BLANK

Devised by C. M. Louttit, Director, Psychological Clinics, Indiana University, and Willard B. Waskom, University of Kentucky.

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Name ..... Sex..... Race..... CA.....

Address .....

Birthdate ..... Birthplace .....

School ..... Grade .....

Parent or guardian .....

Referred by ..... Date .....

Problem .....

.....

Brought by .....

Examiner .....

II. SUMMARY

Diagnosis

Prognosis

Recommendations

Name ..... Date ..... No. .....

III. DEVELOPMENT OF CHILD

Pregnancy conditions

BIRTH: duration .....instruments .....

premature .....Ceasarian .....

injuries .....birth weight ..... resp. .....

where delivered .....

INFANCY: feeding; breast until when .....formula.....

weaning; age ..... reactions .....

first tooth .....last tooth .....

fontanel closed .....

elimination; bowel, age.....bladder, d..... n.....

sit up ..... crawl .....stand ..... walk .....

age talking: single words ..... sentences .....

Other characteristics of development

SEX HISTORY: instruction; age .....by whom .....
nature of

experiences (incl. masturbation)

HEALTH HISTORY. (List diseases and injuries chronologically, giving age, severity and child's reactions.)

EDUCATIONAL HISTORY: pre-school, age..... where .....

enter first grade .....grades repeat .....

grades skip .....average marks .....

school attended

attitude of teachers

child's attitude toward school

preferred subjects

disliked subjects

achievement test results				attendance
date	test	score	%ile	time lost for cause .....
.....				.....
.....				.....
.....				truancies .....
.....				.....
.....				.....
.....				parents' attitude .....
.....				.....

VOCATIONAL HISTORY: age start work ..... kind .....

working papers; where..... date .....
positions held (list all positions, kind of work, length of time, reason for leaving, etc.)

IV. PARENTS AND FAMILY

FATHER: age.....birthdate.....birthplace.....

occupation .....employed by.....

salary ..... how long here .....

health; present .....

disease history .....

.....

excesses; alcohol ..... sex ..... drugs .....

if dead; date ..... age ..... cause .....

remarks

MOTHER: age..... birthdate ..... birthplace .....

occupation .....employed by .....

salary .....how long here .....

work before marriage; occupation .....

frequency work since marriage .....

who cares(d) for children .....

health; present .....

disease history .....

.....

excesses; alcohol ..... sex ..... drugs .....

if dead; date ..... age ..... cause .....

remarks;

BOTH: married ..... how long ..... where .....

attitudes (describe attitudes toward each other, toward children in general, and toward this child.)

discipline (briefly describe the methods of, and consistency of parental discipline.)

SIBLINGS: (list in order, including any who have died.)

order	name	age	sex	remarks

GRANDPARENTS: (Note for each of the four grandparents present state of health or age at, and cause of, death. Have they been in close contact with child?)

COLLATERALS: (Note here any aunts, uncles, cousins, etc. who because of their health history or contact with the child might be factors in the problem.)

V. HOME

PHYSICAL CONDITIONS: size .....kind .....

tenure .....previous homes.....

.....

ownership; cost .....rent .....

furnishings; musical instr. .....

books and magazines .....

electric appliances .....

car .....

food; quantity .....quality .....

remarks

NEIGHBORHOOD: (describe neighborhood with special emphasis on recreational opportunities. Note pool rooms, playgrounds, schools, churches, etc.)

PSYCHO-SOCIAL CONDITIONS: people in home. (Note relatives and boarders not members of the immediate family.)
Other special conditions; (describe any conditions of the home that might be pertinent.)

VI. CHILD'S BEHAVIOR

On this page describe the child's problem and behavior as given by the parent, teacher or other informant. Always indicate the informant.

VII. TEST PERFORMANCES

BINET: revision.....

	1	2	3	4	5	6	7	8	9	
II										
III										
IV										
V										
VI										
VII										
VIII										
IX										
X										
XII										
XIV										
XVI										
XVIII										

SUMMARY

test	score	ratio

PORTEUS MAZE

III	X
IV	XI
V	XII
VI	XIV
VII	XVI
VIII	total
X	

FORMBOARDS

name	1	2	3	%ile	age

RESPONSES

(If necessary continue responses on other side of this page or separate sheet.)

PRE-SCHOOL TESTS

name	placement	+ −	mos. credit

OTHER TESTS

special aptitude

Personality

Others

NOTES ON EXAMINATION

Child's attitude

Special abilities or deficiencies

VIII. PHYSICAL EXAMINATION

ANTHROPOMETRIC: weight ..... height ..... sit.ht. .....

head; circum ..... length ..... brth ..... ht .....

chest; girth, insp. ..... exp. ..... v.c., 1.....2.....3.....

grip; rt. 1.....2.....3..... left, 1.....2.....3.....

HEAD & NECK

CHEST

ABDOMEN

genitalia

EXTREMITIES: UPPER

LOWER

NEUROLOGICAL

SENSORY

vision

audition

other

GLANDULAR—endocrines

OTHER OBSERVATIONS

IX. DELINQUENCY

PRESENT OFFENSE

COURT ..... judge .....

PREVIOUS OFFENSES

INSTITUTIONS & PROBATION

X. SPEECH DEFECTS

TYPE ..... age onset.....

Circumstances at onset

Occurs more frequently when? .....

.....

Sounds have difficulty with

Language spoken at home.....

Associates with speech defects

Structural defects

Other remarks

PREFERRED POSITIONS OF ADVERTISEMENTS IN THE *SATURDAY EVENING POST*

LEONARD W. FERGUSON
Stanford University

IT HAS been conceded for some time by advertising men that there are certain "preferred" positions in the *Saturday Evening Post*. On the basis of an experiment carried out by the writer he is led to believe, however, that at present there are no such "preferred" positions in this magazine.

Ten pages which, *a priori*, might seem to have preferred position values are: (1) the inside front cover, (2) page 1, opposite the inside front cover, (3) the page on which the *Table of Contents* appears, (4) the page opposite that on which the *Table of Contents* appears, (5) the page opposite that on which the first feature begins, (6) the page opposite that on which the *Post Scripts* appear, (7) the center double-page spread, (8) the page opposite that on which the cartoon *Henry* appears, (9) the inside back cover, and (10) the outside back cover.

The *Saturday Evening Post* in its scale of rates "recognizes" four of these so-called "preferred" positions. To secure an advertisement on the inside front or back covers costs $10,350.00, to secure one on the center double-page spread costs $20,700.00, and to secure one on the outside back cover costs $13,500.00. In order to secure an advertisement on a double-page spread any other place than in the center of the magazine costs, unless it is colored, $14,400.00, while a single page costs only $7,200.00. It is important, therefore, for the concern which wishes to use this magazine as an advertising medium to determine the relative value of these so-called "preferred" positions.

The majority of the data for this study was collected in a small rural town of approximately 4,000 inhabitants, while the remainder was collected at Leland Stanford University. The persons from whom the data were secured may be classified as in Table I. All data were gathered by the writer from persons

TABLE I

	Adult (persons earning a living)	College Students	Total
Male	65	12	77
Female	15	2	17
Total	80	14	94

most of whom he knew personally. He influenced no one in any way, however, in regard to the advertisements. Anyone who admitted that he had read, looked at, bought, or had borrowed, or in any way had handled the particular issue of the *Saturday Evening Post* upon which the test was performed and would consent to give the time required was asked to perform the test as explained in the following paragraph.

Any person who fulfilled the above requirements was given a pile of advertisements containing all those (except under one inch in size) which were in the January 13, 1934, issue of the *Saturday Evening Post* and an equal number from other issues of the same magazine which had appeared at least two years previous. Each person was asked to look through the pile of advertisements and to make one out of four possible judgments concerning each one. The four possible judgments that one might have made were that he was absolutely sure of having seen that advertisement in this particular issue of the *Saturday Evening Post;* that he was almost sure he had seen it in that particular number, but was not altogether sure; that he was guessing that it was there; and that he knew definitely that he did not see it in the particular number in question.

The experiments were performed on Thursday, Friday, and Saturday of the week of issue, and on Monday and Tuesday of the next week. As the day of issue was Tuesday, everyone had at least two days in which to glance over the magazine. The persons who were tested later than Thursday, however, had three, four, five, six, and seven days respectively on which they might have looked at the magazine. Needless to say, those who were tested on the following Tuesday were tested only if they

had not yet seen the next issue which, of course, came out on that day.

From the data as collected were computed percentage values for each advertisement. Each value indicated the percentage of readers which noticed each advertisement. The respective values were derived by use of the formula, Average $\% = \frac{100a+75b+25c}{N}$, in which *a*, *b*, and *c* equal the number of times that a particular advertisement was placed in each of the first three possible classifications, and N equals the number of persons tested. One chief disadvantage to the use of this formula is that it fails to take account of the reliability of individual ratings. In other words when using this formula the tacit assumption is made that the reliability of each person's rating is equal to that of any other person. It would have been preferable to have used a formula which took account of individual reliabilities, but due to the manner in which the data were recorded, it was not possible to do this. It must be borne in mind, then, in the interpretation of the results of this study that they are valid only insofar as the individual reliabilities may be assumed to be equal.

The results are tabulated in Tables II and III. To illustrate the use of these two tables consider for a moment the advertisement on the inside front cover. The differences between the attention values for this advertisement and the average attention values for all colored left hand full page advertisements (except those in "preferred" positions) are $-30\% \pm 6$ and $-20\% \pm 9$ for men and women, respectively. The critical ratios[1] are in each case 3.8 and 1.4. Rather than showing any "preferred" effect this advertisement, especially in regard to men, seems to have a significant negative attention value. The data for the rest of the advertisements may be interpreted in this same way.

Mention should be made, however, of the advertisement which appears on the back cover. It has attention values which differ by $5\% \pm 6$ and $7\% \pm 9$ from the average attention values of other left hand full pages, including none in "preferred" positions. These differences for men and women, respectively, yield

[1] Here, and throughout the rest of this article, the term critical ratio refers to the relationship, D/σ diff.

critical ratios of .6 and .5. This comparison may not be quite valid, however, as there is really no rightness or leftness to this page. Consequently a better comparison might be made with the attention values of all other colored full page advertisements no matter whether they are on right or left hand pages. Advertisements which are in "preferred" positions are, however, excluded. In this comparison the above differences become 2%±6 and 10%±9 with critical ratios of .2 and .7 for men and women, respectively. These differences are not, of course, significant.

Rather than revealing any "preferred" positions in the *Saturday Evening Post,* the above results seem to point to three positions which are, with respect to men, less preferred than others. These three are the inside front cover, the page opposite the first feature and the page opposite that on which the *Post Scripts* occur.

A reason which might be postulated for the unpreferred position of the inside front cover is that a great many readers tend to skip over both that and the next one or two pages in order to get either to the *Table of Contents* or to the first feature which they are interested in reading. That such is the case is quite possible for many of the persons who were tested so commented. It should be called to the reader's attention, however, that although the advertisement on page 1 has a very definitely unpreferred position value for men, it *does not* have for women. This is due in all probability to the fact that the appeal of this advertisement is, primarily, to women.

The unpreferred position of the advertisement on the page opposite that on which the first feature appears is also probably due to this fact.

The other unpreferred position is, as mentioned before, the page opposite that on which the *Post Scripts* occur. It would seem, from the position of this page in the magazine, that it should have one of the highest "preferred" position values in the magazine, but such is not the case in this study. There is one peculiar feature about this page, however, which does not enter into the consideration of the attention values of other pages in the magazine, and which may account in part for its relatively low attention values as measured by this experiment. This page

TABLE II*

Average Attention Values of Advertisements Which Are Not in "Preferred" Positions

Sex	Men				
Size	½ page		1 page		2
Position	left	right	left	right	pages
Colored	—	—	52%±4	47%±4	61%±4
Non-Colored	24%±4	23%±4	62%±4	32%±4	62%±4

Sex	Women				
Size	½ page		1 page		2
Position	left	right	left	right	pages
Colored	—	—	39%±8	32%±7	42%±8
Non-Colored	13%±5	23%±7	35%±8	26%±7	43%±8

*Marked sex differences appear in this table. A subsequent experiment was performed to determine whether or not these differences could be explained upon the basis of the sex to which the advertisements appealed. It was found that some part of the differences were undoubtedly due to this fact, but not the whole of them could be so explained.

is used practically all the time by the *Campbell Soup Company* who vary the "copy" in their advertisements very little from week to week. Therefore, although one remembers having seen a Campbell's Soup advertisement, he does not remember having seen a particular one, and so says that he did not see it, rather than take a chance on its having been there. Another factor which must be taken into consideration is that like the advertisement previously discussed, it is intended to appeal more to women than to men. It was found, the reader will recall, that the attention value of this advertisement was negative in effect for men while that for women showed no difference from the average attention value of comparable advertisements.

The remainder of the positions in the magazine seem to have fairly equal attention values. At least no significant differences were found other than the ones just discussed.

The above results seem logical if it be borne in mind that the buyers of the *Saturday Evening Post* may be grouped in three classes: (1) those who buy it in order to read the articles and stories, (2) those who buy it for the humorous sections, and (3) those who buy it principally to look at the advertisements.

TABLE III

Attention Values of Advertisements Which Are in "Preferred" Positions

Advertising	Position	Attention Values Men		Attention Values Women		Differences from values in Table II				Critical Ratios	
1. Heinz	inside front cover	22%	±4	19%	±6	−30%	±6	−20%	±9	3.8	1.4
2. Listerine	Page 1	36	±4	29	±7	+4	±5	+3	±9	.6	.2
3. Florsheim	" 2	34	±4	13	±5	+10	±5	0	±7	1.4	0.0
4. Philco	" 3	38	±4	31	±7	+6	±5	+5	±9	.9	.4
5. Swift	" 4	30	±4	54	±8	−22	±5	+15	±11	3.7	1.3
6. Campbell's	" 25	21	±4	31	±4	−26	±6	−1	±10	3.3	.1
7. Packard	" 52-53	67	±4	52	±8	+6	±6	+10	±11	.8	.6
8. Absorbine	" 103	24	±4	29	±7	+8	±5	+3	±9	1.1	.2
9. Californians	inside back cover	28	±4	18	±6	−19	±6	−14	±9	2.4	1.1
10. Eastman	back cover	47	±4	46	±8	−5	±6	+7	±9	.6	.5

The first class of buyers are usually interested first in the *Table of Contents* or the principal features and thus skip over the first one or two pages, and throughout the rest of the magazine are likely to see only those advertisements which appear on the same pages as do the stories or articles which they read.

The second class of buyers probably see only those advertisements which are next to the humorous sections in which they are interested, and only incidentally see the other advertisements in the magazine.

The third class of buyers probably see more advertisements than either of the other two classes. For them there are probably no preferred position effects. Since the advertisements are not arranged in any special order it is probably due to chance at which advertisements they begin looking. Sometimes they may start in the middle of the magazine and then at other times they may begin at the beginning or the end.

For the particular issue of the *Saturday Evening Post* under consideration a fourth class of buyers must be listed; namely, those who bought it in order to look at a particular type of advertisement. It so happened that the New York Automobile Show was being held at about this time, so the 1934 models were being announced and advertised. Hence this number of the *Saturday Evening Post* contains in all probability an abnormally large percentage of automobile advertising. Many buyers pur-

chased this number of the *Saturday Evening Post* in order to look at the new automobiles and probably saw only incidentally the other advertisements in the magazine.

It can be seen quite readily that the habits of the above various types of buyers, although each may give some "preferred" position value to a particular page, tend to neutralize each other's preferred position effects. Therefore, it would seem justifiable to say that other things being equal nearly all pages in the magazine have approximately the same attention values.

A word is necessary about the method of computation used in this study as it may be objected by some that the procedure used did not adequately separate the attention values of the pages from the attention values of the advertisements which appeared on the respective pages. Suffice it to say that the use of this method gives approximately the same results as the one other method[2] which has been used for this purpose. This other method consists of running a secondary experiment in which every advertisement is given an equal chance of being seen, and then subtracting the values obtained in the secondary experiment from those values obtained in the primary experiment. In order to check upon the comparability of the two methods the calculations involved in Dr. Strong's original study were recomputed according to the procedure used in the present study. The results obtained were those which had originally been obtained.

The results secured in the present experiment differ in two important respects from those obtained by Strong. He found that "the back cover of the *Saturday Evening Post* is undoubtedly a preferred position. . . . This is due not only to the preferred position but also to the use of color." The comparison which he then made, however, was between the outside back cover which *was* colored, and other full pages which *were not* colored. The present writer does not feel that this is a comparable comparison, i.e., insofar as determining adequately what each of the two factors involved contributed toward the attention value of the advertisement which was on the back cover.

[2] E. K. Strong, Jr., Attention value of advertisements in the *Saturday Evening Post*, Research Bull., No. 7, A.N.A.M., March, 1914.

As the present study shows, if the comparison be made between the outside back cover and other colored pages, no significant differences are found. If, however, the comparison were made in the same way that Strong made it, the differences would be significantly in favor of the back cover. Therefore, it may have a preferred position value due both to the use of color and to the fact that it is on the back cover, but either factor considered alone would not cause its attention value to be significantly different from those of other pages, if all other factors are held constant.

The other respect in which the results of the present study differ from those secured by Strong is in regard to the attention values of pages 1 and 2. It was originally found that the attention values of these pages were somewhat greater than those for other pages. In the present study, however, no significant differences were found. This is most likely due to the fact that an extra leaf has been added since 1913. Thus in 1913 there preceded the first feature three advertisements, but now there are five which come before the page on which the first feature begins.

The results of this study rest upon two very important considerations. Due to the manner in which the data for this study were recorded no corrections could be made for variations in individual reliabilities. Therefore, it is implied throughout the calculations that individual reliabilities are approximately equal. The other consideration is the relative extent that the "copy" of each advertisement contributed to its attention values. To what extent this factor influenced the results could not be determined from the present experiment.

In conclusion it would seem justifiable to say that on the basis of the present experiment, there are no "preferred" positions in the *Saturday Evening Post.*

RECALL AND RECOGNITION FOR FACES AND NAMES*

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THE remark "I can remember faces but I can't remember names" is so common as to have become almost a joke. The person who makes this statement usually appears to consider himself unique. Scarcely less of a commonplace to the psychologist is the truth that recognition is much easier than recall. It would be an obvious conclusion from these two facts that, since we usually recognize faces and try to recall names the common experience referred to above is no proof whatsoever that names are inherently harder to remember than faces. If this deductive conclusion is correct it should be verifiable by experiment.

A search through a part of the literature on memory has revealed work on topics related to this but none on this specific problem. The problem can obviously be broken up into two separate parts: (1) the relative difficulty of recognition and recall and (2) the relative difficulty of memory for faces and memory for names. Putting these together we get one total question: the relative difficulty of recall and recognition for faces and names. The deductive conclusion referred to above is specifically stated by Gilliland, Morgan, Stevens,[1] and again by Morgan and Gilliland,[2] though my experimental work on the problem was mainly done before I discovered this statement of my hypothesis. In the last named work the discussion seems ambiguous: "You often hear people say 'I can remember faces but I can't remember names.' The two are quite different. Recalling faces is recognitive memory, while remembering names means recall. It can easily be demonstrated that recognition is an easier process than recall."

*Acknowledgments are due to Dr. J. J. Smith of Muskingum College for suggestions and cooperation and to Dr. R. W. Tyler of Ohio State University for a suggestion about the statistical handling of scores, and to Dean R. W. Ogan of Muskingum College for revising the table.

It is not clear here why recalling should be considered a recognitive process if any difference between the two terms is to be retained. The usual distinction between recall and recognition is obvious and, I believe, fairly well agreed upon. But the treatment of recognition as one phase of memory differs in different psychologies. It is often pointed out that even a recalled experience is not completely remembered unless it is recognized as belonging to the subject's past. This makes recognition an essential part of every complete act of memory. But in experimental procedures it is common to contrast the recognition of a present object with the recall of one not now present to the senses. It is assumed of course that in the latter case the recalled experience is recognized for what it is; but this total process can be contrasted with the other, in which recall is not used and a perceived object is recognized.

It has been said above that recognition is conceded to be easier than recall. Specific statements of this commonplace are less frequent in general works on Psychology than one might expect. They occur in Dashiell,[3] Gilliland, Morgan, Stevens,[1] Morgan and Gilliland,[2] Hollingworth and Poffenberger,[4] Hunter,[5] Meumann,[6] Pillsbury,[7] Pyle,[8] Turner and Betts[9] and Woodworth,[10] and probably many others. The second element—the relative difficulty of faces and names—seems to have received little or no attention. Pyle does say that "memory for objects or pictures of objects is better than memory for names of objects either seen or heard."[11] A list of school situations is given in which the use of visual material gives better results than mere verbal learning. But this does not seem to be strictly to the point. It shows only that visual material aids verbal learning rather than that it is itself easier to retain.

In the vast amount of experimental work that has been done on memory in its different aspects there are investigations that have a bearing on the one or the other of my part problems. So far as I can discover there is nothing on the combination. J. M. Baldwin[12] has reported a study by Baldwin, Warren and Shaw to determine the relative accuracy of three methods of detecting amount remembered. The stimuli were cardboards of different sizes. The three methods were reproduction, identification, and

selection. By identification the authors meant stating that a card presented later either had or had not been included in the series of stimuli. By selection they meant picking out the familiar objects from a larger group with which they are mingled in a random order. It will be observed that this last is the method usually used to test recognition, but that their identification would also be a measure of recognition. They concluded that reproduction was the least accurate and identification the most so. Hollingworth[13] describes an experiment in which twenty items (syllables, words, forms and pictures) were presented visually at intervals of two seconds. Each observer was asked first to recall and then to select from a longer series; and to repeat till both recall and recognition were perfect. The results showed, for every form of stimulus, that reproduction was more difficult than recognition. Hollingworth describes an experiment in which five observers went through an opposites test sixty to seventy-five times. The stimulus card bore fifty adjectives, to which the subject was to give the opposites. Later the subjects were asked first to recall the stimulus words and then to recognize them in a list of one hundred. The average number recalled in three minutes was 14.8; the average number recognized in three minutes was 49.6. The conclusion drawn is that a given number of repetitions has greater value for recognition than for recall. McDougall[14] describes a similar experiment in which a series of ten words was presented both visually and auditorially; later they were recalled and also selected from a longer list. Here again the number correctly recognized exceeded the number correctly recalled. Meumann[15] refers to somewhat similar experiments by Bernstein and Bogdanoff, by Boldt and by Decroly and Degand. Myers[16] using spelling words and a method similar to those described found recognition efficiency to be about two and one half times that of recall.

The relative difficulty of objects and words seems to have received little attention and that of faces and names still less. Gould [17] describes a study in which twenty pictures of men with names attached were studied for five minutes by the observers who were then asked to pick out the faces from among one hundred and to give as many names as possible. The correla-

tion between recognition and recall was .61 but this does not indicate the relative difficulty. It is, perhaps, significant that in scoring, five points were allowed for a name and only one for the correct recognition of a face. To check the reliability of results in this rather artificial situation by comparison with a real one professors of psychology were introduced to students and the memory of the latter was checked as before for recall of name and recognition of face. Here again the correlation was high.

The investigation most closely resembling the present one was that of Mulhall.[18] Photographs and names were both used. The tests were for both recall and recognition. One of her chief problems, however, was to discover the effect of determination to remember. Incidentally it was proved again that recognition requires fewer repetitions than recall. The relative difficulty of faces and names was not a question at issue.

The present experiment was intended to compare with each other the four different measures: those of recall and recognition for faces and names. The material used was the two pages of faces from the Social Intelligence Test by Moss, Hunt, and Omwake. One page contains pictures of the faces of twelve men with the names underneath. The other page contains twenty-five faces of men among which the original twelve are scattered in random order. My material included also an additional page of pictures which was made by cutting out the twelve faces, removing the names and pasting the pictures to a sheet of paper in a changed order. There was also a similar page of twenty-five names including the original twelve in random order. The latter list was included in the mimeographed material which contained instructions and blanks for reactions.

After filling in the blank for personal data the subjects were given three minutes to study the faces and names by any method that they would use in learning the names of real people. Then three minutes more were allowed for writing an introspection on the methods used in the learning period. Though the main purpose of the experiment could be carried out without introspection it was thought that this might reveal some facts of value. Next, the subjects were presented with the original twelve faces in a new order and without names and were asked to write

the names in numbered blank spaces. Again, the names in a random order were presented and the subjects were asked to try to recall each face, and to write S after each name the corresponding face of which they were sure they could recall, D in doubtful cases, and F where the face was forgotten. Of course it is quite frankly admitted that this is not an objective test of recall and that the accuracy of recall cannot be checked by it. But it was desirable, if possible, to measure both recall and recognition for both faces and names if any comparison was to be made and there seems to be no objective way of testing recall of anything so complex as a face. This was followed by the writing of an introspection in regard to the methods of recall. Next the original twelve faces were picked out from twenty-five numbered faces and the corresponding numbers checked on the question sheet. Finally the original twelve names were similarly selected from a list of twenty-five. The test was given to a whole class at a time. Pages were turned in unison at a signal. The time was kept with a stop watch and was uniform for all subjects. The time allowed was different in different parts of the test as determined in preliminary experiments.

There were four hundred sixty-eight cases after a few had been thrown out for failure to follow instructions. The subjects were almost all college students, two or three being from the faculty. As the students were not trained in introspection, their reports on how they learned are not usually couched in language approved by analytical psychologists. They reveal about what we should expect as to the methods used. Special attention to unique features of the faces was mentioned most often, with association of name and face coming second. Other methods are associating with a person of similar name or appearance, repetition, recall and artificial devices. The introspections on the methods used in the recall of faces show that in many cases recall was by imagery usually with special attention to peculiarities that had been noticed and often including the place on the page, sometimes accompanied by the image of some known person who had been thought of, and many by the devices that had been used in learning. In the tests of recall twelve right answers are possible, since there are twelve names or twelve faces, any one

of which might have been recalled. In selecting the right names or faces from among twenty-five, however, it is obvious that there is a correct way of reacting to each of the twenty-five. Each could be marked as recognized or left unmarked. Therefore the highest possible score on each of these is 25. To make all these scores comparable the results in each case have been reduced to per cents right.

TABLE I

Ability of 468 Subjects to Recall Names and Faces and to Recognize Names and Faces

Ability	Mean Score on Test[a]	Standard Deviation of Test Scores[a]	Per Cent that the Sum of Right Scores is of the Sum of Possible Right Scores[a]
(1)	(2)	(3)	(4)
To Recall Names[b]	4.38 ±.10	2.26±.07	36.±2.3
To Recall Faces[c]	6.55 ±.10	2.12±.07	54.±2.3
Difference	−2.17 ±.14	.14±.09	−18.±3.2
To Recognize Names[d]	24.49[b]±.05	1.14±.04	97.±0.9
To Recognize Faces	22.98 ±.09	2.02±.07	91.±1.4
Difference	1.51 ±.10	−.88±.08	6.±1.7

[a] Standard errors of obtained per cents, means, and sigmas, and differences are shown.

[b] The possible score in the recognition test was 25; on the recall test the possible score was 12.

[c] To recall, as used here, means to reinstate in consciousness, presumably as an image in the case of faces. The ability to write a name without seeing it again is evidence of recall.

[d] To recognize means to know as previously experienced. In this case it is evidenced by the act of selecting the recognized face or name from among others that are later presented.

In the main the conclusions based on our data bear out the assumptions made in the beginning of this paper. Recognition gives a much higher accuracy than recall for both names and faces. Names are somewhat easier to recognize than faces as shown by the comparison of 97 per cent accuracy with 91 per cent. However, it is not possible to prove conclusively from our data that names are easier to recall than faces. In fact, if we could assume that the subjects' estimates of their own recall of faces are accurate, we should be forced to conclude just the

contrary—that in the case of faces recall is easier than recognition. It would not be justifiable, of course, to refuse to accept this apparent superiority of recall over recognition in the case of faces merely because it is not in harmony with a preconceived opinion. But the scores on recognition show names to be easier to remember than faces and the scores on recall of faces cannot be objectively checked. Therefore it seems probable if not certain that the scores for recall of faces are too high. This suggests the desirability of further work on the problem, by a method—if such is possible—in which recall can be checked.

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BILINGUALISM AND MENTAL MEASURES

A Word of Caution

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THE great development shown in objectivity in education during the last two decades has led to the conception among those over-zealous to demonstrate the scientific accuracy attained in this field that we are at a point where mental capacities of children can be determined accurately by the mere *application* of the newly devised measuring instruments—standardized mental tests. While sound thinkers in the field of tests and measures have constantly cautioned against the superficial and unanalytical use of these instruments, the quest for a short-cut to critical and exhaustive study of the abilities of school children has led to numerous abuses and errors in the use of mental tests. This is especially true of those who, blindly accepting the doctrine of individual differences, fail to recognize the importance of the fundamental personal, social, and cultural differences of the pupils and of the extremely important question of differences in milieu.

While the misapplication of tests is a matter of general concern and evident in education generally, it is in the treatment of the problems presented by bilingual, or environmentally handicapped, children that the gravest mistakes have been made. The caution with which such prominent students as Terman, Garrett, Otis, Pintner, Freeman and others have approached the use of tests in instances where language or environmental problems enter into the testing situation has been largely ignored or misinterpreted by those, who, equipped with the mechanical technique of application and scoring, have failed to place due weight on the analysis and evaluation of personal differences and of environmental problems.

The fact that tests have in a measure fulfilled their function

of checking on the community of experience of children and on the extent to which children vary in profiting from common experiences has seemingly led many to assume that there is a universality in community of experiences. However, a test is valid only to the extent that the items of the test are as common to each child tested as they were to the children upon whom the norms were based. Only when community of experience actually exists can checks based on that assumption be valid, even if we grant that such checks do symbolize intellectual capacity—an "if" that has serious questions in itself.

The controversial nature of "intelligence" as such and of intelligence as a predetermined, hereditary faculty can easily be appreciated when one reads such works as Spearman's *Abilities of Man*[8] or Chapter X of Beard's (editor) *Whither Mankind*.[1] The latter reference is an illuminating and extremely readable treatment of the question of the relationship between "race" and intellectual achievement. Geo. A. Dorsey, in a humorously satirical manner, is unrelenting and even vicious in his attack upon those who have garbled the facts of genetics, eugenics, and heredity to champion the superiority of "Nordic" or "Aryan" "race." In unequivocal terms the glaring inconsistencies of the doctrine that "like begets like" and that civilization and intellectual accomplishment are linked irrevocably with Nordic heredity are set forth and ridiculed. In addition, outstanding anthropologists and geneticists are cited as authorities for the evidence against the deterministic assumption of a Nordic "corner" on brains. The chapter is a refreshing antidote to the widespread acceptance of the superiority of nature over nurture.

Yet, in spite of the uncertain basis upon which the fundamentals of mental tests rest, time and again students of the bilingual question insist on applying tests and accepting the results uncritically. To be sure tests are tools that should be used for what they are worth. The problem confronting the examiner is that of determining their worth in a particular situation. The worth of test-results lies in their proper interpretation and in the assistance which such interpretation lends to furthering the educational needs of the pupil. An IQ ratio, as such, ***has no value***. It is only when that measure is used critically in promoting the best

educational interests of the child that it has any worth-while significance to the educator. This means that an IQ of 70 is valuable only in relation to the hereditary, cultural, social, and educational background of the child and the way in which that past history can be utilized and improved in making the child the *best possible person he is capable of being.*

While on the surface an IQ of 70 means "moron," actually it means that only to the extent that the past history of the child has been assayed by the test in equal manner, with equal justice, and in equal terms as were the past histories of the children used as the criteria of the test. Even so, it is being granted for purposes of argument that such an assay is a valid one—that what is being sampled really represents evidence of "intelligence."

A few years ago Dr. T. R. Garth [2] of Colorado tested about 1,000 ("Mexican"?) Spanish-speaking children from different communities in Texas, Colorado, and New Mexico. He found that the median IQ of these children was 78, slightly above the point of demarcation for morons. In fact, 50 per cent of the fourth-grade children tested were of 71.8 IQ or below! Uncritical evaluation might lead to the conclusion that at least 50 per cent of the Spanish-speaking children represented by this large sample was unfitted to participate in any but the simplest tasks of life. Such a wholesale indictment of a people would be indefensible—yet such are the results of test *application*. Who would champion the thesis that half or more of the Spanish-speaking, *or any other such,* group is dull, borderline, and feeble-minded when it is generally accepted that only 7 per cent of "normal" groups may be so classified? However, such a champion would find test-results to support his cause!

The writer tested a second-grade group of bilingual children and found the median IQ to be 72.[5] Working on the assumption that the tests reflected a function of the school, remedial instruction in language and language arts was given over a two-year period with the result that the median IQ was "raised" to approximately 100, or normal. Thus the tests served a very useful purpose as tools—though their value as yardsticks of "intelligence" was questionable throughout the entire procedure. The class proved to be a slightly superior group of students throughout later develop-

ment. If initial test results had been accepted at face value, a large percentage of the children would have been classified as belonging in special classes for the dull and some even as belonging in institutions for the feeble-minded!

The Binet Tests, when evaluated for vocabulary difficulty,[6] have been found by the writer to contain many words that do not even appear in the best of recommended word lists for bilingual children—to say nothing of the possibilities that such lists do not represent actual word mastery on the part of the pupils. If many of the words of the tests are unknown, and many but casually familiar or just recently acquired, what can be said as to the experiences and operations, the background and rapport, presupposed by the very nature of the tests? While language handicap in all probability transcends mere speech or vocabulary difficulties, it seems evident that at the very least the removal of such difficulties is a prerequisite to the beginnings of proper measurement. Even so, it is dangerous to assume that by supplying word knowledge the language handicap has been removed.

One investigator [7] used a makeshift "translation" of a test and found that there was no language handicap because the IQ's were not raised by such procedure! What assurance did he have that the IQ's obtained from the "translated" test were comparable to the norms? Why should the IQ's be raised by his procedure? And, is the evidence conclusive that the IQ's were not raised? The whole question is that of whether or not the revised test was the same test as the original in terms of difficulty, suitability, validity, reliability, etc. Similar tactical errors are common in testing programs and in the thinking of many who deal with the bilingual problem.

Of particular interest is the use to which measures or estimates of abilities have been put in other phases of education. Too often professional and scientific use of measures of evaluation is circumvented by attitudes and emotions which have no place in the educational program. From the standpoint of educational theory there are considerations which transcend the practical questions of sentiment, desirability, opposition or acquiescence, etc. Miss Reynolds,[4] of the United States Office of Education, quotes a graduate student who argues for segregation because "the two

nationalities do not associate much . . . Mexican children . . . do not want to play with American children," etc. She also quotes a Los Angeles school official: "Our educational theory does not make any racial distinction between the Mexican and native white population. However, pressure from white residents of certain sections forced a modification of this principle to the extent that certain neighborhood schools have been placed to absorb the majority of the Mexican pupils in the district"! Dr. Paul Taylor [9] quotes a Texas school official: "We don't enforce the attendance on the whites because then we would have to on the Mexicans." Many other such expressions are common and are clearly presented in the studies made by Dr. Taylor. How such attitudes can go hand-in-hand with scientific instruments is incomprehensible, if such instruments are to produce worth-while results. That this condition is one which contributes to the impairment of educational opportunity cannot be denied.

Though not necessarily attributable to questions of attitudes and prejudices, it is apparent to any one who takes the time to examine the records that the state educational system in New Mexico is not functioning efficiently with respect to the bilingual problem. For example, in 1932-33 there was a total of 24,810 Spanish-speaking children enrolled in the first and second grades of the public school system.[8] However, only 540 were enrolled in the twelfth grade—two per cent as compared with a percentage of fourteen for other children. In other words, and in spite of any and all excuses that might be offered, *the Spanish-speaking group is not receiving a comparable education.* Some might counter with the argument that the Spanish-speaking group does not have the capacities to continue in school, so they drop out or are eliminated. It could be granted, only for the sake of argument however, that the group has an average IQ of 85. This means that 50 per cent of the group is above that level and that certainly a number much greater than 540 is capable of doing twelfth-grade work. Then, who has failed—the child or the school? What of compulsory education? What of the duty and responsibility of the State? What of the democratic theory of education?

The flagrant violations of the fundamental aspects of the theory

of education and of the social and economic goals of America that are observed in the practice of education among bilinguals point to the urgent need for greater real professionalization of the educational practitioners and of further public enlightenment. The frequent prostitution of democratic ideals to the cause of expediency, politics, vested interests, ignorance, class and "race" prejudice, and to indifference and inefficiency is a sad commentary on the intelligence and justice of a society that makes claims to those very progressive democratic ideals. The dual system of education presented in "Mexican" and "white" schools, the family system of contract labor, social and economic discrimination, educational negligence on the part of local and state authorities, "homogeneous grouping" to mask professional inefficiency—all point to the need for greater insight into a problem which is inherent in a "melting pot" society. The progress of our country is dependent upon the most efficient utilization of the heterogeneous masses which constitute its population—the degree to which the 2,000,000 or more Spanish-speaking people, and their increment, are permitted to develop is the extent to which the nation should expect returns from that section of its public.

It appears that to those whose interest lies in the field of technical evaluation of the question of the school and the bilingual child there has come the time when fundamentals must be determined. The relative responsibility of the school and of the child in the achievement of desirable goals must be examined. Is the fact that a child makes an inferior score on an intelligence test prima facie evidence that he is dull? Or is it a function of the test to reflect the inferior or different training and development with which the child was furnished by his home, his language, the culture of his people, and by his school? When the child fails in promotion is it *his* failure or has the school failed to use the proper whetstone in bringing out the true temper and quality of his steel?

The school has the responsibility of supplying those experiences to the child which will make the experiences sampled by standard measures as common to him as they were to those on whom the norms of the measures were based. When the school has met the language, cultural, disciplinary, and informational lacks of

the child and the child has reached the saturation point of his capacity in the assimilation of fundamental experiences and activities—then failure on his part to respond to tests of such experiences and activities may be considered his failure. As long as the tests do not at least sample in equal degree a state of saturation that is equal for the "norm children" and the particular bilingual child it cannot be assumed that the test is a valid one for that child. Under our theory of education *the Child cannot fail.* Nevertheless, for comparative purposes, a child or a group may be classed as inferior or superior by measures which do equal justice to the criterion and the child or group. The fundamental questions in mental tests of bilingual children, then, are primarily questions of validity, to wit:

I. Do the tests measure *in that particular child* what they purport to measure? The tests may be valid for the "average" child and still lack validity for an individual or for a particular group. Questions of culture, schooling, socio-economic status, etc., loom big in this phase of the problem.

II. Are the assumptions on which the test was based for the original "norm" children applicable with equal justice to the particular case? If the use of a radio were assumed to sample intelligence, would a Navajo Indian living in a hogan be equally subject to such an assumption as average children, or would the tallying of sheep be a more desirable measure? Is "intelligence" abstract reasoning, memory, "g," "s," etc.? Whatever it is, are the assumptions of what it is justified universally?

While it would be shortsighted to propose the abandonment of mental tests in the bilingual problem, and nothing herein contained should be so interpreted, a note of caution in their use is in order. It should be borne in mind that a mental test is not a measure in the same sense that yardsticks or meters are measures. Mental tests are professional instruments which must be supplemented by intelligent and professional application and evaluation for the best interests of the child or group concerned.

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MEMORY SPAN FOR WORDS PRESENTED AUDITORIALLY*

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Purpose of Study. The purpose of these experiments was to determine the memory span of children of different ages for lists of auditorially presented words. The lists of words were varied with reference to (1) the number of words in a list, (2) the number of syllables in the words, (3) the rate of presentation of the words. The relation of such a study to radio is apparent in the fact that occasionally lists of ideas (words or phrases) are given over the radio with the express wish that the listener

*This article is a résumé of an experiment performed by Mr. Wallace Calhoon at Ohio State University. Although this experiment and the results are primarily of psychological interest, there are certain inferences pertinent to radio which may be drawn from them. Mr. Calhoon carried on this psychological study of memory span as part of a series of studies in radio education supported by the Payne Fund of New York City. The original data and findings of Mr. Calhoon are to be published in four articles[1] and are also available in a complete filed report.[2] The primary responsibility for the interpretations dealing with radio in this article rests with Mr. Lumley. Mr. Calhoon is responsible for the basic facts and conclusions of the experiment.

[1]Calhoon, S. W. *Influence of Syllabic Length and Rate of Auditory Presentation on Ability to Reproduce Disconnected Word Lists. Journ. of Exp. Psychol.*, Oct., 1935.

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Calhoon, S. W. *Relative Seating Position and Ability to Reproduce Disconnected Words Lists After Short Intervals of Time. Journ. of Exp. Psychol.*, 15: 709-722.

[2]Calhoon, S. W. Studies in Auditory Impressionability. M. S. Bound and on file with The Psychological Exchange Library, New York City, and also with the Bureau of Educational Research Library, College of Education, Ohio State University, Columbus, Ohio.

remember some of them. For example, in a geography broadcast several countries may be named, the products produced in these countries may be mentioned, words descriptive of the climate may be used, or other lists of items may be given. In all lists in radio talks there is more or less association between the items, and the amount of association between items determines the ease with which the items are remembered. In this experiment it seemed desirable to determine how much was remembered when the items were not previously associated. This represents an extreme condition but one which is sometimes encountered.

Memory for words (ideas) is a function of the time which elapses between the presentation of the words and the test for memory. Memory may be tested immediately after presentation of each word list or after an interval. In hearing a radio talk in which groups of ideas are given, it is often very important to remember the first group of ideas in order to understand the second group. Insofar as the listener can not keep in mind the three or four facts presented in the first paragraphs, he may be embarrassed in comprehending the thought of the following paragraphs. Similarly, for even smaller units, it is necessary to keep in mind the words at the first of a sentence in order to effectively follow it to its conclusion.

When sentences and paragraphs are printed and read the reader can always return and supply what he does not remember by a second look at the forgotten passage. In listening to talks, and in particular to radio talks, this can not happen. The listener must remember what has been said or he is lost. It is therefore of the utmost importance to know how much the radio listener, and indeed any listener, can keep in his mind of what has been said immediately before. Does he remember a percentage of all that has been said or does he remember an absolute amount? In other words, if one passage contains eight ideas and another passage ten ideas, will the listener to these passages remember four ideas from the first passage and five from the second (50 per cent), or will he remember four from the first and four from the second (an absolute amount)? The practical significance of the results, should they favor the second hypothesis, is that the number of ideas given together would have to be definitely

limited. The extent of this limitation would depend upon the immediate auditory memory span as determined by actual test. This fact is especially important if the listener is to use these ideas as a basis for understanding the parts of the talk immediately following.

In this experiment, therefore, lists of ideas (words) were presented auditorially to listeners and a determination of the amount remembered from the different lists was made. This study concerns memory for disconnected material and should be supplemented by a study on the auditory span for closely associated or connected material.

Method of the experiment. Lists of words were constructed by consulting Tidyman's [3] third grade list and Dale's [4] list of words recognized by pupils of different grade levels. By this means words were chosen which were familiar to all the children taking part in the experiment. The number of words in a list varied from two to twelve. One-syllable, two-syllable, and three-syllable words were used. The children who heard the word lists and were tested for their memory ranged from the third grade through the twelfth grade; 946 pupils participated. Conditions were carefully controlled so that no disturbances took place during the experiment. Because of the distortion introduced by available recording equipment, it was found inadvisable to record the word lists and present them by record over a loud speaker in an effort to duplicate radio reception. Therefore the experimenter simply stood at the back of the room and pronounced the words himself. The word lists were presented at three different rates, namely one second, two seconds, and three seconds between each word. Pupils were requested to write down the words they had heard immediately at the conclusion of the presentation of each list. For other details of the procedure and control of the situation the original reports should be consulted. In the following

[3] Tidyman, W. F. *Survey of the Writing Vocabularies of Public School Children in Connecticut.* Teachers Leaflet No. 15, U. S. Department of the Interior, Bureau of Education, Washington, D. C.

[4] Dale, Edgar. *Familiarity of 8,000 Common Words to Pupils in the Fourth, Sixth, and Eighth Grades.* Columbus, Ohio: Bureau of Educational Research, Ohio State University. 84 pp. (Mimeographed.)

sections, some of the most interesting results are set down.

Relation between seating and comprehension—memory. It has always been the practice of teachers to seat partially deaf children in the front rows. This is an avowal of the fact that all parts of the room are not equally good for hearing a radio or classroom presentation. But is there a noticeable difference between the amount heard and remembered when children of average hearing ability are seated in different parts of the room? The experiment in memory for word lists offered an opportunity to study this.

Pupils listening to these word lists were distributed at random over the room and therefore the relation between their memory scores and the distance away from the person pronouncing the words could be determined. The relationships were computed, modified by the following factors: number of words in lists, number of syllables in words, rate of presentation, and age of pupils. (The significance of the general conclusion was strengthened by the fact that the essential relationship was shown regardless of the presence of some of the above factors.)

The results showed that pupils further away from the speaker were able to write down fewer of the one-syllable words than pupils nearer the speaker. This relationship was shown most distinctly for the third through the sixth grades and was not noticeable for the high school grades. The relationship was most clearly shown for words presented at the fastest rate (1 word a second) and became less evident at the slowest rate (1 word every 3 seconds). The relationship was shown most strongly for one-syllable words and only to a very much reduced degree for three-syllable words.

The significance of this finding lies in the fact that younger pupils at a distance from the speaker are able to fill in material with which they are familiar when several cues are given (as in the case of three-syllable words), but are not so well able to do this when an isolated item is given. If one might hazard a guess as to the use of this finding, an instance might be thought of as follows: The teacher who is telling a story, or giving a narrative description, may assume that children in the back of the room will be able to follow as well as those in front, as long

as the story deals with connected events which are partially familiar. However, when new names or new isolated ideas come in, the teacher may find it best to write or indicate them on the blackboard. In geography the classroom teacher would certainly find it advisable to supplement the radio instructor's account of a country's products with a notation of them on the blackboard.

Memory span for lists of words. The importance of knowing the memory span has already been discussed in the first section of this article. Here, only the results of the memory span experiment will be given and also a few interpretations. It must be stressed again that the results to be given have been derived from lists of separate words, not connected in any special way with each other. This situation is naturally quite different from the usual one where words are given in connected sequence to form a series of ideas. The separate words in this experiment may be regarded as separate ideas, since each word probably suggests an idea to the listening pupils.

The results show that the memory span is apparently an absolute span. This means that within limits the number of words remembered and written down is independent of the number of words in the list presented. Two and four word lists were found to be too short to properly measure the span. For longer word lists the number of words remembered was about the same irrespective of the number of words in the list. A possible exception to this generalization occurred for word lists of 12 words.

The memory span or number of words reproduced varied with the age of the pupils. Taking a combined score (for the varied rates of presentation, the varied number of words in a list, and for one-syllable words), the memory span for the third grade was 2.1 words, fifth grade 3.2, seventh grade 3.7, ninth grade 4.1, and twelfth grade 4.7. The results for the other grades are not given here but may be obtained by consulting the original data.

Relation between syllabic length and memory span. In the previous section figures for the number of words remembered by pupils of different grades were given without regard for several factors. The first of these factors is the number of syllables in the words. It is self-evident that a list of four two-syllable words is

different from a list of four one-syllable words, but it must not be assumed that the former equals a list of eight one-syllable words. Each of the words in the two-syllable word list is a unit in itself—an association of two monosyllables confirmed by use and familiarity. It is possible to measure the strength and importance of this association between the two parts of the word in helping the pupil remember the series. This can be most simply done by comparing the number of words remembered from a four two-syllable word list pronounced at the rate of one every two seconds with the number remembered from an eight one-syllable word list pronounced at the rate of one a second.

Such comparison shows that for the third through the sixth grades nearly as many two-syllable words were remembered as one-syllable words. The number of remembered syllables from the two-syllable word lists divided by the number of remembered syllables from the one-syllable word lists gave a ratio of 1.9 (upper limit 2.0). For the upper grades (seventh through twelfth) the ratio for three-syllable words and one-syllable words was 2.3 (upper limit 3.0). These figures show that the use of familiar combinations (combinations of syllables which make ordinary words) enables the listener to deal with these combinations as units and achieve almost as large a memory span with these compound units as with the simple units.

But although the effect of the association of the syllables in forming words is very important in aiding the pupil to remember the lists, not so many four-syllable words were remembered as three-syllable words, not so many three-syllable words as two-syllable words, and not so many two-syllable words as one-syllable words. (The number of words in a list was the same.) This fact held without regard to the rate of the presentation of the words in the lists. Expressing this observation in a different fashion, it may be said that the number of words remembered became less as the number of syllables in each word became greater. For the third through the sixth grades, the memory loss for three-syllable words as compared with two-syllable words was less than the loss for two-syllable words as compared with one-syllable words. For the higher grades the loss for four-syllable words when compared with three-syllable words was less than

the loss for three-syllable words as compared with one-syllable words.

Rate of presentation and memory span. The words in the lists in this experiment were pronounced at different rates. These rates were: one word a second, one word every two seconds, and one word every three seconds. What is the effect of this rather large variation in rate of presentation on the ability of pupils to comprehend words and remember them? It is well known that radio speakers vary greatly in their rate of speech, although a good average is 160 words per minute. Does rate of speech or presentation of ideas exercise a measurable influence on the listener? Sufficient lists of words were used so that it was possible to determine the influence of the rate of presentation when such other factors as number of syllables and number of words in list were held constant.

Strangely enough, the effect of the rate of presentation was very irregular. Although there was a tendency for the number of remembered words to increase with an increase in the time interval between pronouncing each word, this tendency was by no means consistent. The tendency was most clearly shown by pupils in the seventh and eighth grades. Figures illustrating this may be expressed in this fashion. For each pair of grades there were 12 chances of having the decrease in rate of presentation (lengthening of time between words) accompanied by an increase in the number of words remembered. For the third and fourth grades the number of times the increase occurred was 7, for the fifth and sixth it was 7½, for the seventh and eighth 11, for the ninth and tenth 6, and for the eleventh and twelfth 8. For the ninth and tenth grades, the number of increases (6) was that to be expected by chance alone. The rate of presentation seemed to have no effect for these two grades. In all other grades but the seventh and eighth, the figures were but slightly better than chance. The effect of the rate of presentation was shown more clearly in contrasting the results for the one-second and two-second rates than those for the two-second and three-second rates. These results seem to indicate that it is more important to limit the number of ideas given in a group than to control the time of their presentation.

Memory span for digits and words. As a supplementary part of this experiment, the same pupils were given lists of digits and asked to remember and write down these digits after hearing them. The presentation of the digits followed the last of the word list tests, so that the pupils were well adapted to the testing situation by this time. Special lists of words given in between the lists of digits were used to control the effect of practice. Pupils were asked to write both the digits and the words in the order in which they heard them. The lists of digits were of varying lengths and repeated digits were only contained in the lists with ten digits. This fact may have been of importance with reference to the greater memory span for digits over words found in the experiment. This difference between ability to remember and write down digits and words amounted to about two and one-half units. In other words, if lists of eight words and eight digits were given, the pupils might remember 3½ words and 6 digits.

This superiority of digit comprehension and memory was consistent and of about the same amount for pupils in all grades. The total span for digits increased with the length of the lists of digits given. However, the following values for lists containing 8, 9, and 10 digits will show that the total span does not lie much beyond 7. When 8 digits were given, 6.10 were remembered; 9 digits given, 6.37 remembered; and 10 digits given, 6.43 remembered.

Summary. In this article, the following experimentally proved facts have been set forth:

(1) Children seated at a distance from the source of sound are less able to understand and remember lists of separate words than those seated nearer to the person speaking. This effect is greatest for younger children (third through sixth grades) and for words of one syllable.

(2) The memory span of children for lists of auditorially presented words is an absolute quantity which varies with the age of the child. Within certain limits children remember as many words from a list of six words as from a list of ten words. The average span ranges from 2.1 words for children of the third grade to 4.7 words for pupils in the twelfth grade.

(3) When memory for two-syllable words is compared with memory for one-syllable words, it is evident that the important factor is not the number of syllables but the number of groupings of the syllables into words. This points to the well known fact that by properly grouping items it is possible to greatly increase understanding and memory for the material presented.

(4) Decreasing the rate at which words are spoken makes it possible for seventh and eighth grade children to remember more words in lists of a given length. However, this relationship is not shown clearly for pupils in either the lower or higher grades. Furthermore, the gain in proportion to the increase in time is slight. These results, of course, only hold for the intervals used in the experiment, namely every second, every two seconds, and every three seconds.

(5) Memory span for digits (numbers) is consistently better than memory span for words. Where the pupil might remember 3½ words from a word list of given length, he will remember 6 digits from a digit list of equal length. There is a possibility that this difference may be explained by the fact that the number of digits is limited to 10, whereas the number of words is almost unlimited.

From these facts the certain interpretations may be made with reference to radio. It must be recognized that these interpretations are assumptions, but they constitute at least a fair judgment as to the proper use of the radio, and they are based upon psychologically basic data.

> One of the basic assumptions in transferring the conclusions from word lists to radio talks rests upon the relationship between words and ideas. For this reason an attempt is made here to clarify this relationship and analyse the meaning of the term "unit." One of the fundamental properties of the human mind is its ability to associate, to group, or to organize. This association or organization may be carried on in several different planes of complexity. Thus a single radio talk is a unit in itself. It is an organized and associated whole, as

distinct from other radio talks. But it may easily be broken up into several topics, more or less closely associated according to the custom of the radio speaker. In a geography talk on one country the topics of climate, products, and physical characteristics of the land may be discussed. In turn, under climate the speaker may talk about the rainfall, the prevailing winds, the length of the days, and the like. These sub-topics can be further broken down. The amount, location, time of occurrence and frequency of the rainfall may be given. Under "amount" the sentence, "The eastern part of Southern Rhodesia has nearly 40 inches of rainfall, the western part only 15 inches," might be found. There are two amounts given, 40 and 15. Furthermore, the amounts are given in inches; they might have been expressed in some other fashion. We have now broken the radio talk down into its component words, and each of these words has some sense and some relation to the rest of the talk. We could break the talk down into individual letters.

At each step in this breaking down process we have a series of units. We may call these units ideas. These ideas at each level of organization are all associated in the mind of the speaker. He knows his material; he is giving the talk. These ideas are also more or less associated in the minds of the listener; to the extent that they are not associated, he is learning from listening to the talk (by forming new associations). The listener's understanding of the talk will be easy or difficult according to the number of already known associations between ideas in the talk. If he already knows the associations between the various factors in the climate, then the climate will be one idea for him. If the listener does not know these associations, and must learn them from the talk, then the climate will be composed of a number of subordinate ideas—ideas of rainfall, winds, sunshine, atmospheric pressure, etc. The units and ideas in a talk exist as such in the listener's mind. A well organized talk for scientists may be no more than lists of words for the

layman. We can have single ideas expressed by words, groups of words, paragraphs, etc.

In this sense the higher organization of a talk is related to its component words, and the assumption is made that relationships observed for isolated words may hold for isolated groupings of words—in short for separate ideas. Upon this basis the following interpretations of the word-list conclusions are drawn.

The interpretations given below are numbered to correspond with the word-list conclusions given previously:

(1) Great care should be taken in seating children at a uniform distance from the loudspeaker, so that the volume may be adjusted to the proper level and so that children will not misunderstand and forget parts of the broadcast because of their seating position. This is probably especially important in listening to foreign language broadcasts, arithmetic broadcasts, and others where the material is somewhat disconnected. It is not so necessary when the material is closely related and the child can fill in from his experience what he misses.

(2) Since the child will absorb just so much in a single presentation, and no more than this, the necessity of short presentations and well organized and grouped ideas becomes clear. The child will not retain a per cent of all that is given. Rather, he will retain a certain amount regardless of the length of the presentation. Therefore the speaker should select three or four ideas and develop them. Then he should allow the child time to assimilate these ideas. Finally, he may pass to another group of ideas. Too many radio talks have been crammed with facts in the hope that if more facts are given, surely the listener will retain some of them. This experiment seems to show that the listener will retain facts up to a certain number, and that all facts in excess of this are lost upon him. A concrete illustration of the applicability of this generalization comes in the teaching of foreign languages. How many words should the broadcaster give at one time if he expects the listeners to write them down from dictation or repeat them out loud? Listeners' comments on broadcast foreign language courses have indicated that the teacher may give too many.

Groups of more than six and seven words were found to be too long for even second-year French students.

(3) The successful radio speaker should never give isolated ideas but should endeavor to tie up the ideas closely with one another. If he can associate the ideas in ways which are already familiar to the listener, he may be sure that the listener's task of understanding and remembering his points is considerably simplified. Furthermore, he may be assured that the number of units (syllables, words, etc.) which the paragraph contains is immaterial as long as the units are associated and combined into a few major ideas. This is the reason why some speakers can talk very rapidly and at great length over the radio without losing their listeners. They may use many words and sentences but the ideas which these words and sentences express are few.

(4) The rate at which a radio speaker talks is not especially important, within certain limits, as far as understanding and memory go. The listening school child, if the total presentation is short, will grasp a portion of the points whether the delivery is faster or slower. Of course, the rates used in this experiment do not correspond with actual radio speech rates. They may, however, correspond with idea rates.

(5) Broadcasters who have a fondness for repeating telephone numbers, street addresses, and prices may be assured that an attentive listener will remember limited lists of these numbers long enough to write them down. It is important, however, to prepare the listener to hear the numbers. The upper limit of the memory span for numbers does not lie much beyond seven.

Some of these interpretations of the basic psychological data may not fit actual experience in using the radio. That is to be expected since conditions are greatly different. Nevertheless there is great need for fundamental psychological research to determine how human beings act when they are subjected to all sorts of auditory stimuli and situations.

THE "PERSONAL EQUATION" IN SERIAL PURSUIT PERFORMANCES*

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THE CONCEPT OF "GENERAL" MOTOR ABILITY

IT IS sometimes proposed that motor ability is "general," that is, that one may expect an individual who displays a high degree of ability in one motor performance to rank high in other motor performances. Casual observation of the performances of college and professional athletes often seems to provide positive evidence for the validity of this proposal. College athletes frequently excel in more than one sport and acquire numerous "letters." It is not unusual, furthermore, to read that a professional baseball player also plays good golf or that a ranking golfer is also a good tennis player. However, despite such positive suggestions from the field of sports, the hypothesis of "general" motor ability has not obtained general confirmation from the psychological laboratory. A considerable number of investigations bearing on this subject have been carried out and the evidence reported has been in large part negative. As a rule these investigations have found that the performance of an individual in one task gives but slight indication of the rank he will hold in the performance of another task. These results have been taken to mean that, in a given test situation, elements specific to that situation play the most important part in determining the score made.

EVIDENCE CONCERNING "GENERAL" MOTOR ABILITY

Perrin,[1] Muscio,[2] Griffits,[3] Dorcus [4] and others, using labora-

*This experiment was done under the direction of Dr. R. H. Seashore at the University of Oregon. It was reported at the 1930 meeting of the Western Psychological Association at the University of Southern California in Los Angeles.

[1]Perrin, F. A. C. An experimental study of motor ability. *J. Exper. Psychol.*, 1921, *4*, 24-57.

tory tests such as simple reaction time, steadiness, speed of tapping, aiming, card dealing, etc., reported intercorrelations between the various measures which were generally low and positive. A representative figure taken from the tables published by these investigators is .25. In the light of these results, therefore, they feel justified in denying the existence of "general" motor ability.

Tests emanating from the gymnasium as well as laboratory tests have been employed by Garfiel[5] and Cozens.[6] With such tests as running, jumping, throwing and climbing they have reported intercorrelations whose median is in the neighborhood of .25. Farnsworth, Seashore and Tinker[7] reported a rho of .15 between simple reaction time and speed of serial discrimination to visual stimuli. R. H. Seashore,[8] using a battery of eight tests of serial nature again has obtained positive intercorrelations which are small, ranging around .25, from tests whose reliabilities average .84. Correlations less than three times the probable error between simple reaction time in pressing a telegraph key and speed of tapping the same key for short periods of time have been found by four different experimenters, Perrin,[1] Reymert,[9] Ream,[10] and R. H. Seashore.[11]

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[3]Muscio, B. Motor capacity with special reference to vocational guidance. *Brit. J. Psychol.*, 1922, *13*, 157-184.

[5]Griffits, C. H. A study of some motor ability tests. *J. Appl. Psychol.*, 1931, *15*, 109-125.

[4]Dorcus, R. M. Performances of athletes in coordination tests. *J. Comp. Psychol.*, 1923, *3*, 475-499.

[5]Garfiel, E. The measurement of motor ability. *Arch. Psychol.*, 1923, *9*, p. 47.

[6]Cozens, F. W. The measurement of general athletic ability in college men. *Univ. Ore. Publ., Phys. Educ. Ser.*, 1929, *1*, No. 3, p. 192.

[7]Farnsworth, P. R., Seashore, R. H., & Tinker, M. A. Speed in simple and serial action as related to performance in certain "intelligence" tests. *Ped. Sem.*, 1927, *34*, 537-551.

[8]Seashore, R. H. Stanford motor skills unit. *Psychol. Monog.*, 1926, *39*, 51-66.

[9]Reymert, M. L. The personal equation in motor capacities. *Scand. Scient. Rev.*, 1923, *2*, 177-194.

[10]Ream, M. J. The tapping test: a measure of motility. *Psychol. Monog.*, 1922, *31*, 293-319.

[11]Seashore, R. H. Studies in motor rhythm. *Psychol. Monog.*, 1927, *36*, 142-189.

It is apparent from these exemplary studies that performances in various tests, whether laboratory tests of motor aptitude or tests of extra-laboratory activities, are largely determined by factors specific to each particular test situation. In evaluating this conclusion, however, it is important to note the method employed in all these studies. No effort was made to equate or determine the effects of possible differential factors in the test situations. The subjects were tested on different performances in which such factors as previous training, muscle group employed, sense organ used, the pattern of stimuli, the pattern of response, etc., operated in a totally uncontrolled fashion. This being so, the measurements obtained were the resultants of an unknown and uncontrolled mixture of the elements entering into the test situations.

ANALYSIS OF MOTOR PERFORMANCES

In contrast to the method employed by other investigators Reymert [9] compared motor performances in which only the element of "muscle group employed" was permitted to vary from test situation to test situation. That is to say, he attempted to render equal over the various test situations all possible variable factors but one. This method would enable him to say to what extent an obtained performance was due to the presence in the respective test situation of a particular "value" or "state" of this one variable. Measuring simple reaction times from seven different muscle groups operating by way of the foot, the thumb, the elbow, the head, the index finger, the lips and the jaw to the same auditory stimulus, he found moderately high intercorrelations of about .60. These results he considered as evidence for the existence of a "personal equation" for simple reaction which would account for the performance of one muscle group being, to an important degree, representative of the performance of another muscle group in the same task. In addition he proposed that a second but different "personal equation" existed for serial performances whose effect would be to bring about a high degree of correlation between the performances of different muscle groups on the same serial task. Adequate verification for this suggestion was not included, however, in his report.

The present experiment represents the beginning of an attempt to analyze the relationships existing between four given serial performances by determining what contribution is made to such relationships by each of the discernible variable factors entering into the four performances. In this experiment the variable element of "muscle group employed" was selected for study and the attempt made to measure its contribution to the relationships between the four serial performances. The variance in this element was limited to the four limbs, the right arm, the left arm, the right leg, and the left leg, i.e., in each of the four respective performances a particular one of these four limbs was used, other variable elements being experimentally equated over the four tasks. Further experiments in which other factors such as "sense organ used," "sensory pattern," "response pattern," etc., were studied will be reported elsewhere. In addition the present experiment will serve to provide evidence bearing on Reymert's contention that a "personal equation" will be found for serial performances.

DESCRIPTION OF APPARATUS AND PROCEDURE

Fifty men, sophomore students of the University of Oregon, formed the experimental group employed in the experiment. All the testing was done by the same experimenter and, as nearly as could be judged, the motivation was good for all the subjects. Duplicate instruments [12] for stimulation and reaction were placed in front of S, one at shoulder level and the other about a foot off the floor. S was seated so that his feet swung free directly in front of the lower instrument. The legs were not handicapped by having to bear the weight of the body. A baton was strapped to each foot and one provided for manual use to be held freely in the hand. In the center of each reaction instrument was an octagonal aperture through which S thrust his baton. On the alternate inner surfaces of this aperture, strips of metal were mounted on light springs and so constructed as to act as keys in an electrical circuit. A small electric bulb was mounted adjacent to each such key and just outside of the aperture. S

[12] Campbell, M. Instrument for measuring the serial reaction times of large muscle groups. *Amer. J. Psychol.*, 1934, *46*, 481-483.

observed one of these lights turned on and reacted by striking with his baton the metal plate or key adjacent to it. This action served automatically to turn off the light and turn on one of the other three. S accordingly moved his baton to the new position of the light which caused a repetition of the instrument's action and the operation was repeated in this manner as fast as S was able to operate the keys during a time limited trial. The measurements with the legs were made in exactly the same manner as with the arms, S operating the instrument by means of the baton strapped firmly to the foot in use.

The use of this instrument tends to equate several possible differences between the four test situations. Variations in the extent and type of recoil movements made by the limbs in operation were limited by placing the targets in an enclosed space. The width of the targets was fully one half of the distance to be traveled in reaching them which served to equate differences between performances in accuracy of limb movement. The movements required of the limbs were very simple and very short which served to reduce a possible advantage in flexibility of the arm performances over the leg performances. The legs were hanging free thus making their performances more like those of the arms than if S were standing while operating the instrument. The visual sense organ was used in all performances. The keys were built to operate whether struck hard or lightly which served to reduce any possible advantage to the arm performances due to delicacy of touch. The distance to be traveled in reaching any target was made so short that the time taken up in traveling to a target after starting a reaction was materially reduced. These various characteristics of the test situations may be presumed to have limited the measured differences between the four respective performances to those brought about by the capacities for speed of reaction of the four respective muscle groups involved.

In giving the test the apparatus was first demonstrated and explained to S by the experimenter so that he understood the purpose of the experiment, how the instrument operated, and what he was to do. The batons were then strapped to his feet and he took his place on the seat in front of the instruments.

The height of the seat was adjustable so that the subject's foot could be made to hang directly on a level with and in front of the lower instrument. He was then allowed a few trial responses with the hand and with the foot to accustom him to the "feel" of the apparatus. Following this preparation 15 trials of 20 seconds duration each were given to each arm and each leg. The right arm performed the first trial, the left leg the second, the left arm the third, and the right leg the fourth. This series was repeated until each limb had performed the required 15 trials. About 10 seconds intervened between any two trials. Fatigue probably did not enter into the measurements to an important degree since the work was light, the trials short, and the alternation of the limbs from trial to trial provided a minute or two of rest between any two trials for a particular limb.

RESULTS AND CONCLUSIONS

Satisfactory reliability was obtained in all four measurements. The reliability coefficients, which are shown in Table 1, range from .96 to .98.

TABLE I

Reliability Coefficients

Right Arm	Left Arm	Right Leg	Left Leg
.98±.01	.97±.01	.96±.01	.96±.01

In computing the reliability coefficients for the performances of the four limbs the first 5 trials were discarded and the average score made on the second 5 trials was correlated against the average score made on the final 5 trials. The score for any trial consisted of the number of correct reactions made during the 20 second interval.

TABLE II

Means and Sigmas

	Right Arm	Left Arm	Right Leg	Left Leg
Mean	46.8	46.9	44.5	44.5
S. D.	3.9	3.9	3.5	3.5

The mean score represents the average number of correct reactions per trial for the final 5 trials.

TABLE III

Intercorrelations

	Right Arm	Left Arm	Right Leg	Left Leg
Right Arm		.98±.01	.86±.03	.86±.03
Left Arm	.96±.01		.87±.03	.87±.03
Right Leg	.84±.03	.84±.03		.99±.01
Left Leg	.84±.03	.84±.03	.95±.01	

In computing intercorrelations between the various limb performances the average score of the final 5 trials was used as representative of the limb's performance. In Table III the uncorrected coefficients are shown in the lower left hand corner and the same relationships corrected for attenuation are expressed again in the upper right hand corner.

Approximately the same mean score was made in all four performances. Those performances in which the arms were used had approximately the same mean scores whereas those in which the legs were used had identical mean scores although the latter scores were about 5% smaller than the former. While this difference between arm performances and leg performances in mean score is small absolutely, it is statistically significant (D/oD=8.15), and probably indicates the extent to which the experiment was unsuccessful in equating the various performances for accuracy of limb movements.

In Table III are shown the intercorrelations of the four performances. These figures may be interpreted as indicating that the ratios between the scores obtained in the four performances by any one individual are, to a high degree, constant for all individuals of the group. A subject who ranks high among his fellows in the performance in which the right arm functions will have approximately the same rank in the performances in which the left arm functions. Somewhat less approximately he will have the same rank in the two performances in which the legs are used.

It may be noticed in Table III that the correlations form two groups, one a group of four correlations, all .84, and the other containing the remaining two correlations, .95 and .96. It is apparent that the one group contains only correlations between performances in which the limbs employed were arm and leg

or, in other words, were from opposite ends of the body. The other group contains the two correlations between performances in which the limbs employed were right arm vs. left arm and right leg vs. left leg or, in other words, were at the same end of the body. In this experiment a performance employing a particular limb is very similar to those other performances in which limbs at the opposite ends of the body are used and is almost identical with that performance in which the other limb at the same end of the body as itself is employed. From this experiment it is not possible to provide an explanation for this apparent anatomically differential effect among the obtained intercorrelations.

While these results seem to confirm Reymert's contention that a "personal equation" exists for serial reaction, it should be kept in mind that they are dependent upon the procedure adopted in this experiment. Four serial pursuit tasks were performed under conditions which were experimentally imposed in an attempt to render equal over the four performances all the factors which might influence them except the muscle group used. Under these conditions and where speed alone was emphasized in the four performances, the existence of a high degree of "general" motor ability seems to have been demonstrated. That is to say, the differential effect among the four performances of the variable element "muscle group employed" present in the test situations is comparatively small.

DOES GUESSING DISTORT THE RESULTS OF THE METHOD OF TRIPLE ASSOCIATES?[1]

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VARIOUS applications of the questionnaire method and of the interview are becoming increasingly popular in the field of advertising research. Link's Method of Triple Associates is an outstanding example. Critics of this method have claimed that the influence of guessing may distort the results, while Link's rebuttal submits "clues as to the small extent to which guessing is a factor in these tests."[2]

The factors determining the extent to which guessing may distort the results of Link's Method of Triple Associates can be divided logically into two categories: the prevalence of guessing; and the probability of guessing correctly.

THE PREVALENCE OF GUESSING

The greater the proportion of people guessing, *caeteris paribus*, the greater will be the extent to which guessing distorts the results. If no one ventures a guess, guessing can have no influence.

On the prevalence of guessing Dr. Link has presented some negative evidence—the percentage of people who do not guess. He has pointed out that 90 per cent of the answers to the question, "What building company advertises, 'I smell smoke'?", fall into the "Don't Know" category.[3] The potential guesser, however, is not likely to guess on this question unless he knows the name of a building company which engages in national advertising. The large number of people who did not guess on this question might be the result of the fact that few people know

[1]The authors gratefully acknowledge the valuable suggestions of H. P. Longstaff.

[2]Link, H. C., A new method of testing advertising and a psychological sales barometer. *J. Appl. Psychol.*, 1934, 18, p. 7.

[3]Ibid.

the name of a building company that could be considered a possible answer. It must be admitted, however, that this objection does not apply to all of the cases in which there have been high frequencies of "I don't know" answers.

An attempt to determine the prevalence of guessing was made at the University of Minnesota during November and December, 1932. The subjects were 473 undergraduate students of whom 53.9 per cent were women.

The test consisted of seven actual advertising slogans and six fictitious slogans, all patterned after the Method of Triple Associates. The false slogans had been selected previously by making lists of several false and actual slogans and asking subjects to classify each as true or false. By this procedure six false slogans were selected that were called true on the average as often as the actual slogans were classed as true.

It was assumed that every answer to a question containing a fictitious slogan was the result of guessing. The results are presented in Table I.

TABLE I

Question	Frequency of Guessing	
	Number	Per cent
What automobile advertises: "Get that extra mile per gallon"?	150	31.7
What baking powder advertises: "Don't take chances with your cake"?	256	52.0
What radio advertises: "The difference is in this tube"?	202	42.7
What typewriter advertises: "If Shakespeare had had a portable"?	191	40.4
What dust-mop advertises: "The choice of discriminating housewives"?	69	14.6
What hat for men advertises: "A hat to fit your features"?	156	32.9

It is possible, of course, that these students who are used to taking objective examinations in which guessing is not discouraged are more likely to guess than a more representative sample of the population.

Furthermore, a few of the fictitious slogans might express the same general idea that has been the basis of an actual ad-

vertising theme, although the investigator made every effort to avoid this error.

THE PROBABILITY OF GUESSING CORRECTLY

The fewer brands a person knows, the greater will be his chances of guessing correctly—assuming that one of these brands is the correct answer. If every guesser can recall the names of ten brands of cigarettes, one out of every ten guessers should guess correctly if the correct answer is one of these ten brands.[4]

If we assume that every wrong answer is the result of guessing, we can determine the number of people who guess correctly. This results from the formula

$$R = \frac{W+R}{Y}$$

from which

$$R = \frac{W}{Y-1}$$

Where R is the number of correct guesses, W is the number who guessed wrong less those who did not list the brand in question, and Y is the average number of brands known by the group. Those not listing the correct brand as one of their known brands were subtracted from the total number wrong since it was assumed that it was impossible for them to have guessed correctly. The value of the probability factor, Y, was obtained by asking each subject to list all of the brands of that particular product that he knew. These data were used also in correcting W.

The results are presented in Table II.

Whether or not these percentages are high enough to have any practical significance we shall not attempt to decide. Our only comment consists of a repetition of the warning that college students who are used to objective examinations may be more likely to guess than a more representative sample.

[4] As a matter of fact, the above assumption is probably too conservative. In reality the probability of guessing correctly is likely to be slightly higher than the above assumption indicates. A study that is now being made may yield some evidence on this issue.

TABLE II

Question	Subjects Who Guessed Correctly Number	Per cent
What cigarette advertises: "No tricks just *costlier* tobaccos"?	11.6	2.5
What brand of aspirin advertises: "No tablets are genuine —— aspirin without this cross"?	3.3	0.7
What salt advertises: "When it rains, it pours"?	32.5	6.9
What brand of raisins advertises: "Have you had your iron today"?	50	10.6
What ink advertises: "The quick drying ink"?	9.8	2.1
What baking powder advertises: "The double-action baking powder"?	64	13.5
What automobile advertises: "Ask the man who owns one"?	10	2.1

Our data do suggest, however, that certain precautions should be taken in interpreting the results of surveys based on the Method of Triple Associates. Obviously, the influence of guessing is not constant: on some questions its influence is much greater than on other questions. Consequently, inter-product comparisons may be dangerous. It might be imprudent, for instance, to compare the results of a Camel cigarette theme with those of a Calumet baking powder theme, because the average subject knows the name of several brands of cigarettes but only a few brands of baking powder; so his chance of guessing correctly is greater for a question on baking powder than for a question on cigarettes. If such inter-product comparisons must be attempted it is advisable to correct the results by applying the formula which has been presented.

As a corollary to this generalization it is suggested that the wording of the Triple Associates question influences the probability of guessing correctly. If the question states the name of a specific product (coffee, laundry soap, etc.) the probability of guessing correctly is greater than if the question states only the general name of the commodity (food, etc.) or does not name the product at all. An example of the first type would be, "What electric refrigerator is 'Dual-automatic'?" [5] An example of the

second type would be, "What company advertised 'So we made a Smaller Spool'?" [5]

In one of his articles Dr. Link has reported the results on thirteen of these questions.[5] If we divide these questions into two groups on the basis of the two types mentioned in the preceding paragraph we find that there are six questions of the first type and seven questions of the second type. Furthermore, it will be noticed that not one of the questions of the second type was answered correctly as frequently as any question of the first type. Might not a possible explanation be in terms of the greater probability of guessing correctly on questions of the first type?

To avoid misunderstanding we wish to repeat that we are not condemning Link's Method of Triple Associates. On the contrary, we heartily endorse it as the best instrument in its field. We are suggesting, merely, a few refinements that might be employed in interpreting the results of surveys in which the Method of Triple Associates is used.

[5] Link, H. C., A new method of testing advertising effectiveness. Harvard Bus. Rev., 1933, 11, 165-177.

STATISTICAL SUMMARY OF AMERICAN EDUCATION

How many schools are there in the United States? How many pupils are enrolled? How many students graduate from high school and college each year? How many teachers are there? What is the income for schools? What is the amount of school expenditures? What is the value of school property?

Answers to these and other important questions dealing with American education the Federal Office of Education answers in its Statistical Summary of Education, 1931-32, which contains assembled facts for more than 127,000 school districts.

The Federal Office of Education reports receiving information about 276,555 schools of different types throughout the United States. Individual reports came to Washington from more than 40,000 of these schools.

It was estimated that in 1932 there were 232,750 public elementary schools and 26,409 public high schools. Elementary schools of the one-room type are decreasing in number and high schools appear to be increasing in number. There were 5,556 fewer public elementary schools in 1932 than in 1930, and 2,479 more public high schools

(including junior high schools) in 1933-34 than there were in 1930.

About one fourth of the nation's total population attends school daily. More than 30,550,000 students were enrolled in full-time day schools, according to last reports reaching the Federal Office of Education: Elementary school enrollment, 23,570,000 pupils; Secondary school enrollment, 5,590,000; College enrollment, 1,150,000; Enrollment in state and private residential schools for exceptional children, 67,600; Federal Government school enrollment, 56,000 Indians and 4,600 natives of Alaska; Public night school enrollment, 1,064,000; Summer school enrollment, 485,500; Part-time and continuation school enrollment, 257,000. Summer school or extension and correspondence courses in colleges in 1931-32 also enrolled 850,000 students.

It is estimated by the Federal Office of Education that more than 833,000 students graduated from high school in 1931-32. There were 138,000 students graduated from first-degree courses in colleges. The Federal Office of Education also estimates that in 1932 there were 1,900,000 living college graduates and 8,100,000 living high school graduates who had not continued their education through college. The Statistical Summary announces that of every 1,000 persons 21 years of age and over in 1932, about 25 had college degrees and 109 had high school diplomas.

There are approximately 1,063,000 teachers in all types of schools in the United States. About 700,000 of these are in elementary schools, about 250,000 in secondary schools, and about 90,000 in colleges.

The estimated total income for all education from kindergarten through college, public and private, reporting to the Federal Office of Education was $3,083,808,785. ($2,459,000,000 for elementary and secondary education, $567,000,000 for colleges, and about $58,000,000 for residential schools for exceptional children.)

Including schools in Alaska and Government schools for Indians, the expenditure for all levels of education, public and private, the Federal Office of Education reveals was $2,968,019,400, according to last reports. (Elementary, $1,700,000; High School, $700,000,000; College, $544,000,000.) All publicly supported education could have been paid for if each person of voting age would have contributed 9 cents a day in 1932, the Federal Office of Education announces. About 2 cents in addition would have paid the bill for private education. The annual expenditure per adult for public education was $32.95, and for private education, $7.10. School plants were worth approximately $758,000,000 more in 1931-32 than in 1929-30.

THE INFLUENCE OF HEALTH UPON INTELLIGENCE AND SCHOOL GRADES OF HIGH SCHOOL PUPILS

MELISSA BRANSON STEDMAN

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A SURVEY of the health of high school pupils in a normally healthy community revealed the fact that health defects were the most consistent causes of school retardation. Over 91 per cent of all pupils were afflicted with one or more health defects which affected their school success. The average grades of those with health defects were found to be only 76 per cent that of the healthy group.

It was found upon examination of the health record cards made out by the school doctors in their routine examinations that out of 450 children, only 39 were without any defects; that 128 had defective tonsils; 70 had heart ailments; 91 had eye defects; 136 had defective teeth; thirteen had affected lungs; and 312 had posture or orthopedic abnormalities.

The 450 pupils included in the survey were those whose health and psychological records were complete. With very few exceptions these children were active in school and in play and had all the outward appearance of perfect health.

The average number of grade points per semester for each group was as follows:

39	Healthy children, average grade points	11.36
13	Children with lung defects, average grades	7.33
136	Children with defective teeth, average	8.33
91	Children with eye defects, average grades	8.88
70	Children with heart defects, average grades	8.93
312	Children with posture and orthopedic abnormalities, average grade points	9.58

The Terman Group Test of Mental Ability was used as a measure of intelligence, the physical examinations were the routine examinations made by the school physicians, and the grade points were taken from the grade cards sent home to the parents. The grade points were computed by multiplying each

subject by one if a grade of "D," which is just passing; by two if a grade of "C" had been recorded; by three if a "B," and by four if the grade were an "A." All grade points for all subjects were added together as a measure of that semester's accomplishment.

Charts were then made for groups according to the Intelligence Quotients in order that each group of children might be compared with the other groups of the same intelligence. Each child's record was completed and the names clipped from the sheet in order that the experiment might be absolutely impersonal.

The average of those without physical defects was 11.36 grade points per semester, while the average grade points for all students with physical defects was only 8.64.

With the one exception of defective lungs, the group with defective teeth received the lowest grade point average, the number so affected being 136 out of 450 children. Therefore, 30 per cent of high school pupils are getting only 64½ per cent of the value of their education because of defective teeth.

Defective eyes affected 91 students or over 20 per cent of the group. The average grade points of this group was 8.88, which was only 78 per cent efficient as compared with the average for healthy children.

Children with defective lungs had the lowest grade point average but there were only thirteen of the four hundred fifty so affected. The average number of grade points was 7.33 as compared with an average of 11.36 grade points for the healthy group.

The average grade points for the 178 children with tonsil and adenoid defects was 9.38 as compared with 11.36 grade points for healthy children. These children were afflicted with other defects as well.

Three hundred twelve of the four hundred fifty children had either defective posture or orthopedic abnormalities, but since this group contained most of the other defects it is possible that posture might have been a symptom of other troubles. At any rate, whatever the cause this group made up 69 per cent of the whole group and they were only 80 per cent efficient in their school work as compared with the healthy group.

The seventy children in the group with defective hearts had grade points averaging 8.93, which was an efficiency of only 78.6 per cent.

The low accomplishment on the part of physically handicapped children holds good for each group at each intelligence level. Intelligence has a very decided influence upon grade points earned, and for each group at each level of intelligence the girls earned higher grades than boys. Possibly this might have been due to more outside activities for boys but more probably it is because the female is psychologically conditioned to endure pain more stoically than the male, which is part of nature's equipment for motherhood.

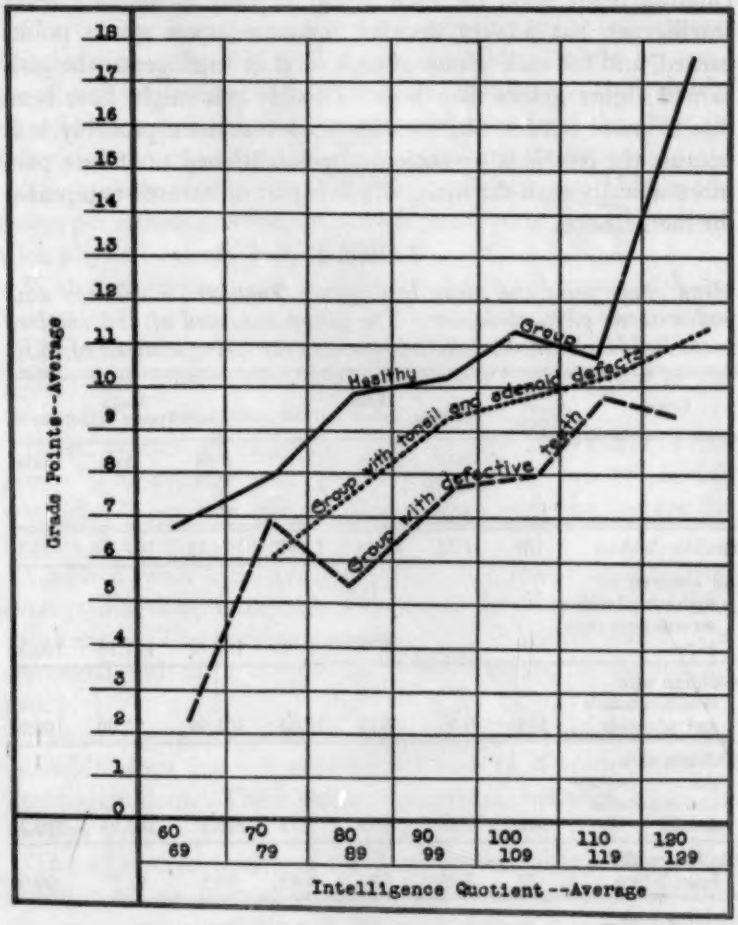
TABLE I

Mean grade point and mean Intelligence Quotient for children with and without physical defects. The group consisted of 450 children in the Bell High School, Bell, California, in the spring semester of 1930.

Group	Number of cases	Mean Grade Points earned			Mean Intelligence Quotient		
		Both boys & girls	Boys	Girls	Both boys & girls	Boys	Girls
Healthy children	39	11.36	10.45	11.67	104.18	107	103.21
All children in high school whose records were complete	450	9.38	8.76	9.92	100.62	101.38	100.34
Children with defective tonsils and adenoids	128	9.50	8.19	10.02	101.99	97.00	102.04
Children with defective posture and orthopedic defects	312	9.18	8.59	9.73	100.7	100.95	100.2
Children with heart defects	70	8.93	7.8	9.45	99.5	98.5	99.9
Children with eye defects	91	8.88	7.86	9.48	101.5	101.59	100.0
Children with teeth defects	136	8.33	8.15	8.71	100.35	100.85	99.25
Children with lung defects	13	7.33	6.38	8.45	97.75	96.3	98.65

FIGURE 1

Graph showing curve of grades earned by healthy children as compared with children with defective teeth, adenoids, and tonsils; showing grades of each group for each intelligence level.



LEGEND

——— Healthy Group—39 cases
····· Tonsil and Adenoid defectives—178 cases
— — — Teeth defectives—136 cases

TABLE II

Table showing the influence of health upon school grades among high school students at each intelligence level

Boys and Girls	Intelligence Quotient	Groups according to health defects with average grade points for each group							
		Healthy	Average for all	Defective					
				Tonsils and Adenoids	Posture Orthopedic	Heart	Eyes	Teeth	Lungs
Boys	50-59		3.00		3.00				
Girls									
Boys	60-69				1.95			1.95	
Girls		7.00							
Boys	70-79			7.95	6.95	8.95	7.77	5.95	
Girls		8.00		5.95	5.10	7.93	4.95	8.95	4.95
Boys	80-89	10.00		6.55	6.36	6.62	7.77	6.30	2.00
Girls		10.00		6.86	6.77	7.95	8.09	6.52	
Boys		9.00		8.95	8.35	6.75	8.42	7.47	6.95
Girls	90-99	10.62		9.79	9.74	8.60	9.87	8.49	7.28
Boys	100-109	7.95		8.31	9.68	8.16	8.73	8.42	7.45
Girls		12.35		10.55	10.35	8.71	9.78	8.45	
Boys	110-119	9.45		6.82	9.88	9.95	7.45	10.29	11.95
Girls		11.95		11.34	11.44	10.20	10.76	10.62	15.95
Boys	120-129			10.45	8.75			8.28	
Girls		17.95		12.11	11.45	14.95	10.07	10.98	7.95
Boys	130-139	15.95			5.95				
Girls		11.95		15.95	16.20	15.45	14.95	17.95	
Average at all levels of Intelligence	Boys	10.45	8.76	8.19	8.59	7.8	7.86	8.15	6.38
	Girls	11.67	9.92	10.02	9.73	9.45	9.48	8.71	8.45
	Mixed	11.36	9.38	9.5	9.18	8.93	8.88	8.33	7.33
Number of Cases	Boys	10		50	151	20	35	94	7
	Girls	29		128	161	50	56	42	6
	Total	39		178	312	70	91	136	13
Average I.Q.	Boys	107.0	101.4	97.	100.9	98.5	101.6	100.8	96.3
	Girls	103.2	100.3	102.	100.2	99.9	100.	99.3	98.6
	Mixed	104.2	100.6	101.9	100.7	99.5	101.5	100.3	97.7

By referring to Figure 1, it is to be noted that the grades go up with the IQ, but that those without health defects go up on a higher level of grades than do those with health hazards.

One significant thing to be noted by this chart is that the children with IQ above 115 are more acutely affected by health than are those with lower intelligence levels. Those in the healthy group show a sudden spurt upward in grades at the IQ of 115 or over, while those with teeth defects show a downward trend in grade points at this point. The evident explanation for this is that the child with high IQ is possessed of a super-sensitive nervous system and is more acutely concerned

TABLE III

Table showing the influence of health upon school grades among high school students at each intelligence level

Intelligence Quotient	Healthy	Groups according to health defects with average grade points for each group						All Pupils
		Children with defective:						
		Tonsils and Adenoids	Posture or Ortho-pedic	Heart	Eyes	Teeth	Lungs	
50-59			3.00					3.00
60-69	7.00		1.95			1.95		4.50
70-79	8.00	6.53	5.53	7.81	4.95	7.28	4.95	6.02
80-89	10.00	6.52	6.54	7.38	7.86	5.96	2.00	7.12
90-99	10.31	9.67	9.12	8.17	8.73	7.84	7.15	9.16
100-109	11.62	9.95	9.92	8.47	8.67	8.47	7.45	9.83
110-119	10.75	10.2	10.58	10.63	9.79	10.23	13.95*	10.88
120-129	17.95	11.69	10.11	14.95	10.07	9.81	7.95	11.8
130-139	14.00	15.95	14.50	15.45	14.95	17.95		14.00

*Only one pupil, therefore, not sufficient for a true average.

with pain sensitivity than the more stolid child of lower IQ.

Healthy children show a higher average level of intelligence than the other groups. The average for all children included in this particular survey was an intelligence quotient of 100+, while the average IQ for the healthy group was 104. The lowest group in average intelligence was the group with lung defects. This applies to the average of the group only, since as individuals many physically handicapped children are of high intelligence.

It would be impossible to know whether lack of intelligence on the part of the parents to care for the children has brought on health hazards or whether ill health has brought on a slowing up of mental traits. An intelligence rating for the parents would be necessary to decide this issue. While the difference is evident when one views a large group, the variability within the group is so great that for individual cases the difference is negligible.

A survey based upon a larger group of tubercular children with follow up through the years to detect whether or not the IQ was changing or not, along with intelligence tests of parents and siblings of these children should develop some interesting results.

But irrespective of the psychological reasons back of the slow-

ing up of mental processes in cases of poor health or of what future surveys may show this survey revealed a vital need for medical and dental care for school children. If ill health slows up school success it will continue to slow up success in life after leaving school; and this may eventually lead to the individual becoming a public charge. The psychological effect is to condition the child to an acceptance of failure and to be satisfied with low accomplishment which may stay with him through life.

It is wanton waste for the state to pour money into education and at the same time to nullify its work by failing to furnish medical and dental care that would make education effective.

Many states have compulsory education laws; and some states require that all persons not high school graduates attend full time day school up to sixteen years of age. Yet no state either compels or makes available health care, except in rare cases of paupers. Some city schools have a limited health service and some counties have a limited county health service to schools. This service calls for doctors and dentists to make physical examinations, but the work of the school doctor, nurse, or dentist usually stops with the physical examination and cautiously given advice "to see the family doctor or dentist."

In a very large number of homes there is just enough to pay for shelter, clothes and food, and it seems easier to get along without medical care than without food. The child is taken to the doctor only when the disease has become acute and when the parent is frightened, but when he finds that death is not imminent treatment is discontinued.

When every dollar is so desperately needed it is difficult to budget for medical care since the amount cannot be accurately anticipated, and the family of moderate or small income is in constant fear of going to the doctor because it may mean a burden of debt for months and years to come.

The psychological effect is as harmful as the disease. Hidden disease may cause nervous disorders which in turn cause abnormal glandular activity bringing on digestive and other troubles completing the vicious cycle of ills and counter ills. If the patient goes to a doctor at all the doctor probably may not be a psychiatrist, and knowing the family's limited financial condition

he calls it a neurosis and tells the parents "not to worry, the child will outgrow it." Even if he should tell the parent to take the child to a psychiatrist the parent would not only not feel inclined to go to a specialist for an "imaginary ill," or would become panic stricken and think the child insane. The layman understands the doctor who sets a bone, but psychiatry is so far beyond his understanding that he either thinks that the psychiatrist's job is only to care for those who are "crazy," or else he may think of the psychiatrist as something of a soothsayer. Little has been done to educate the public to the fact that nervous and mental disorders are as normal as stomach disorders.

Free clinics as now organized are not a solution. Any plan which savors of charity or pauperizes the individual is not a solution. Children who are sent to clinics are sensitive to poverty. The child goes to the clinic thinking that it is like the public schools, free to all alike, but after a humiliating ordeal he finds that the clinic is only for the very poor. Rather than admit his dire poverty he goes without medical attention until it is too late for successful treatment. A small percentage do go to doctors irrespective of their ability to pay, but the large number of children with health defects that go uncorrected indicates that most of them do not go to doctors soon enough.

Public Health Departments and County Hospitals are doing wonderfully well in their field but they do not cover the field mentioned. Public health departments, state, county, and municipal, are bringing up the standards of sanitation, pure food, and in preventative work in communicable disease; but public health departments do not treat diseases except to the very poor, and then inadequately.

Every physically defective child is a potential charge upon society and even though he may not actually become a public charge his efficiency is impaired.

Any solution to be successful must take into consideration the psychological background and mode of thinking of both the medical and the lay public. It is to be hoped that any solution which may finally be adopted will be satisfactory to both the doctors and to the layman.

Doctors have acquired a "mental set" against any form of

public medicine. That mental attitude must be overcome in some manner. The depression is doing much to overcome it. The medical profession, because of the fact that most doctors are humanitarians, have taken the attitude that the public should trust them implicitly, and eventually they will work out the problem, but things are reaching a crisis and both public and the doctors are getting discouraged.

The Los Angeles County Medical Association Bulletin says in regard to the medical situation: "The major ideal of the medical profession is to render medical service to those who need it, regardless of their ability to pay. In normal times this ideal with but mighty few exceptions has been lived up to. In these abnormal times the doctor is still striving to carry this load which has been doubled and quadrupled until now it is exhausting his capacity to carry it. During the present year $12,000,000 worth of medical care has been contributed by the 2000 doctors of Los Angeles County through the Los Angeles County General Hospital and other charitable causes, and this burden is growing too great for the doctors to carry alone."

A sidelight on this situation is the fact that the Los Angeles County Supervisors found it necessary to cut the budget for the County General Hospital and the County Health Department below the subsistence level but at the same time appropriated $400,000 to the Chamber of Commerce for out of state advertising.

Whatever one's personal beliefs it is evident that some solution must be found to save the health of school children if civilization is to survive the stress, strain and complexity of a machine age.

Also the medical profession must become aware of the fact that the problem is not just a problem for the medical profession, and that since it is the health of the lay public that is at stake, for that reason the layman must be consulted and cooperated with in his efforts to solve the problem.

Until the layman has something to say about the solution he will not be altogether satisfied with any solution worked out by doctors alone.

State medicine is anathema to the medical profession but unless the medical profession in cooperation with laymen find a solution, and that quickly, state medicine is inevitable.

The health of school children, their whole future, and the welfare of civilization cannot be sacrificed upon the altar of wrong or selfish thinking of any group.

There is much to be said for state medicine or some form of social insurance against sickness, provided it is free from corporation control and the element of profit.

The majority of doctors are not over paid, for the money collected goes into expensive and inefficiently distributed equipment and overhead. Instead of a number of doctors having access to the same equipment each tries to have complete equipment and much of it lies idle most of the time.

Public medical and dental care made available to the general public irrespective of wealth or poverty would make education more effective and would make for more efficient distribution of equipment, as well as tend to direct patients to right medical and dental care and away from quacks who prey upon weak and sick humanity.

Public education has not made teachers less educated, less ethical, or caused them to have less regard for the children placed in their care; and to believe that it would have any more detrimental effect upon the medical profession is an insult to the men who are giving their lives to the medical profession.

It is probably true that some of the more commercially inclined would leave medicine to go into more lucrative callings but that would be for the ultimate good of the profession. A regular salary and good equipment for the best doctors and dentists would free them from the constant commercial pressure and the necessity of keeping the patients moving in order to handle enough of them to pay overhead, and would leave the doctor free to devote his time to the healing of the sick and the arresting of disease at its onset without fearing to cut off his income by healing his patients.

It would not only tend to eliminate the commercially inclined who go into the profession as a means of making a fortune, but it would give an opportunity to the idealist to do painstaking careful work for humanity, instead of being crushed by a commercial machine and the necessity of making office expenses.

In this matter of child health the public schools are not alto-

gether blameless. More attention to health education would probably prevent many health hazards. The problem which affected more children than any other and had the greatest influence upon grades was teeth defects; and doctors are more and more recognizing teeth as the greatest source of illness.

Teachers of young children should be more alert to recognize the beginning of decay in teeth and schools should furnish dental care at once, and without the question of payment. The child's health would thereby be preserved before a health hazard had time to develop.

Evening Schools and Parent Teachers' Association schools for parents might very profitably be conducted. It would seem that the P. T. A. might very well dispense with afternoon teas and instead spend their time conducting courses for parents in the physical and mental care of their children. School physicians, dentists, nurses, and psychologists might very profitably spend an afternoon a week in instruction to parents in child care and child health.

The problem is equally the problem of the school, the home and the medical and dental professions and no adequate solution can be found until all cooperate in the common goal of the welfare of the child.

UNITED STATES EDUCATIONAL DIRECTORY FOR 1935

Nearly fifty per cent of all institutions of higher learning in the United States are located in ten States, the Federal Office of Education recently announced in its 1935 Educational Directory. Of 1,662 institutions included in the new college guide, 783 are found in the following states: New York, 100; California, 99; Illinois, 99; Pennsylvania, 97; Texas, 86; Iowa, 64; Ohio, 64; Massachusetts, 62; Missouri, 60, and North Carolina, 52. Pennsylvania, New York and Ohio lead the other States in number of colleges and universities with 51, 45, and 45 respectively. Illinois, New York and Pennsylvania have more professional schools than any other States.

There are 158 teachers colleges in our country. Of this number, 13 may be found in Pennsylvania, 10 in Wisconsin, and 10 in Massachusetts. New York also leads in number of normal schools, while California, Texas and Iowa report more junior colleges than any of the other States. Most of the Negro colleges and universities may be found in Texas, North Carolina, Georgia and South Carolina.

Approximately one-third of all institutions of higher learning in the United States are controlled by the Protestant denominations. About one-fourth are State-controlled, one-fourth privately controlled, about one-ninth under Roman Catholic denominational control, and one-ninth under district or city control.

There are 229 colleges for men in the United States, 270 colleges for women, and 1,163 coeducational institutions in the United States. Of this 1,662 total, 107 are Negro institutions of higher learning.

In addition to the college section of the 1935 Educational Directory there are three other sections published by the Federal Office of Education as follows:

Part I—State and County School Offices throughout the United States, the most complete national guide list of State school officials and county school superintendents available. (In Press)

Part II—City School Officers, listing names and addresses of city school superintendents, supervising principals, business managers, research directors, and superintendents of Catholic parochial schools. (Price 5 cents)

(Continued on page 825)

THE EFFECT OF AN ASSOCIATIVE TECHNIQUE IN TEACHING PITCH AND INTERVAL DISCRIMINATION*

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THE problem of this experiment was to determine whether individuals who are especially defective in music interval and pitch discrimination can by the use of an associative technique be appreciably improved.

Contrary to Seashore [1] who has held that pitch discrimination is little affected by practice and that little children deficient in pitch remain so in spite of training, Mursell [2] believes that ability to discriminate pitch can be improved up to a physiological limit determined by the structure of the ear.

Wolner and Pyle [3] experimented with elementary school children deficient in pitch discrimination and found that by a direct method of training the pupils whom they selected learned to distinguish pitch and sing with considerable accuracy. These two experimenters could have made their work more valuable if they had used some objective test for the selection of pupils defective in pitch, had measured the amount of improvement after training by an objective test, and had had a control group of equal age and intelligence. Some of the improvement found by them might have been due to growth alone. Seashore's norms [4] indicate that

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*This study forms a part of a Master's thesis, which was done under the direction of Dr. M. M. White.

[1] Carl E. Seashore. *The Psychology of Musical Talent.* Silver, Burdett Company, New York City, 1919.

[2] James L. Mursell. *Principles of Musical Education.* The Macmillan Company, New York City, 1927, pp. 13-38.

[3] Manual Wolner and W. H. Pyle. "An Experiment in Individual Training of Pitch Deficient Children." *The Journal of Educational Psychology,* XXIV: 602-608.

[4] Carl E. Seashore. Op. cit.

accuracy in judgment of pitch increases up to seventeen or eighteen years of age.

PROCEDURE

The Seashore test in pitch[5] was given to 58 music students of the University of Kentucky. Of these, the seven students who made the highest and the seven students who made the lowest scores were selected as subjects. One of these soon discontinued work at the University. Of the remaining thirteen subjects, the lowest three and the highest four were selected for training; the other six, including three low and three high, were used as a control group.

Each pupil received individual instruction for thirty minutes on alternate days of the school week. The average amount of time spent on the training of each pupil was ten and one-half hours, extending over a period of seven weeks.

The training procedure was as follows: The perfect fifth interval D—A was played on the middle register on the piano. Allowing a short lapse of time after each playing, the interval was repeated three times. The student was then asked to associate the tones with the ringing of chimes or church bells. After suggesting this analogy the interval was again repeated three times. When the subject felt that he was able to detect the bell or chime-like quality of the interval he was told to call it "chimes" from then on. In order to emphasize to the pupil the tonal association suggested, a series of other intervals combined with the perfect fifth was slowly played.[6] By this method the pupil was able to compare the different intervals with each other. Playing the perfect fifth in combination with other intervals was the next step taken.

When the writer felt that the pupil had been thoroughly trained in distinguishing the perfect fifth intervals from the others, as indicated by his ability to make the discrimination in every key

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[5] Carl E. Seashore. *Manual of Instruction for Measures of Musical Talent.* Columbia Phonograph Company, New York, 1919.

[6] One subject was unable to associate the term "chimes" with the perfect fifth interval. However, when the term "violin tuning" was substituted for "chimes," she readily formed the connection with the interval.

of the major mode, the experimenter commenced teaching the major sixth. With this interval the pupil was led to associate the term, "Annie Laurie." None of the subjects encountered any difficulty in forming this association. The procedure followed was to a great extent like that of the perfect fifth interval except that when the subject thought he was able to distinguish the major sixth from other intervals, he was told to think of the first three tones of the song, "Annie Laurie," while listening to the interval.

Using the same criterion as in the case of the perfect fifth, to determine when the student had mastered the major sixth interval, we then started training on the perfect fourth. This interval was played three times on the middle register of the piano and the subject was asked if the intervals did not suggest the bugle call, "Taps." In order to emphasize the analogy the tones of the interval were played separately and a tone a major third above it was added to the second tone of the interval. This gave an effect of the first half part of the song, "Taps." To illustrate further, tones G and C, making the perfect fourth, were played separately but rapidly following each other and the tone E was added after a short time interval. After the pupil thought he had learned the characteristic quality of the perfect fourth, the interval was mixed in with the two intervals previously learned and the subject was asked to name each interval by its descriptive name, i.e., "chimes," "Taps," etc. At this period of training the pupil was repeatedly cautioned to listen first and get some sort of picture of the intervals and their associations before attempting to name them. In the case of the perfect fourth they were encouraged to add mentally the major third above the interval and see if it did not complete the tune for "Taps."

The writer is indebted to Winslow [7] for a list of sixty-one words expressing the five "universal" mood reactions in music. These words have been of great assistance in the training of the intervals that are to follow. In teaching the diminished fifth, the list of sixty-one words was presented to the student and he

[7] Agnes H. Winslow. *Lecture-Laboratory in Appreciation and History of Music.* Educational Department, Victor Talking Machine Company, Camden, New Jersey, p. 41.

was asked to choose the word or words that he thought was associated with the interval. The pupils generally selected the words "tumult" and "longing" from Winslow's list. This association having been formed with the interval, the procedure was similar to that of the previous intervals. Comparatively little difficulty was experienced by the pupils in learning the diminished fifth. When learned the interval was mixed in with the three intervals already learned in order that the pupil might have an opportunity to review and compare them.

The remaining intervals, namely, the minor sixth, diminished seventh, the octave, and the major and minor thirds were presented in the same manner. Table I contains a list of words most often selected by the pupils to associate with the remaining intervals.

TABLE I

LIST OF WORDS ASSOCIATED WITH THE REMAINING INTERVALS

Names of Intervals	Words Associated with Intervals
Minor Sixth	Meditation, Reverence, Wistfulness, Contemplation
Diminished Seventh	Chaos, Caprice, Playfulness
Major Third	Happiness, Gladness, Restrained Joy
Minor Third	Mystery, Grief, Sadness, Sorrow
Octave	Comfort, Passivity, Resignation

The writer was not interested in the pupil's selection of a particular word for a certain interval. He was only interested in seeing that the pupil had formed some association with an interval so that the discrimination might be facilitated.

When the pupil had learned all the mentioned intervals by the association process, training for recognizing them by their respective technical names was begun. The terms, "chimes," "Annie Laurie," "Taps," and the like were no longer used. Instead, for these were substituted the terms, perfect fifth, major sixth, perfect fourth, etc. During this training period subjects were frequently unable to recognize the intervals in terms of their technical names. However, when a subject was told to use the associated terms for the interval, the difficulty was invariably overcome and he was able to name the interval correctly.

The subjects were next given training with the Whipple forks.[8] These consisted of a standard A fork, 435 double vibrations per second, and ten other forks higher than the standard A fork by 30, 23, 17, 12, 8, 5, 3, 2, 1, and .5 double vibrations per second. The form of drill used was as follows: The fork differing by .5 double vibrations from fork A was struck and followed by striking the fork 30 double vibrations from A. The subject stated which fork sounded higher in pitch, the first or the second one. If the subject was mistaken he was corrected. Next, forks 1 and 23 were struck and the pupil was again told which tone was higher. Other pairs of forks used were 2 and 17, 3 and 12, and 5 and 8. To increase the difficulty, subjects were drilled on the following pairs: .5 and 1, 1 and 2, 2 and 3. It will be observed that at the beginning the drill was comparatively simple, but it gradually became more difficult until even the superior students needed training with the forks. Since it was difficult for the pupils to discriminate between the two tones, ten trials were given for each of the three pairs of forks last mentioned. Daily improvement for each pupil was measured by the number of correct responses made on each of the ten trials for the three combinations.

In the latter part of October, 1933, Miss X and Mr. Y commenced training under the technique already described. However, since these two pupils were especially defective in pitch, a more intensive drilling over a longer period of time was required to train them. Training continued up to May, 1934, and was interrupted only by the Christmas and Easter holidays. It is thus seen that the training of these two pupils was more elaborate than that of the seven who were later trained and that they formed a basis for the technique already mentioned under group training.

RESULTS

From the figures shown in Table II we see the following: (1) The experimental group increases in score 58 points or an average increase of 8.3; (2) the untrained group decreases one point or an average decrease of —.16 after testing for the second time; (3)

[8] Guy M. Whipple. *Manual of Mental and Physical Tests, Part I.* Warwick and York, 1914, pp. 213-23.

TABLE II

SCORES AND RANKS MADE ON THE SEASHORE TEST IN PITCH BY THE THIRTEEN PUPILS

Subjects	Experimental Group						Untrained Group					
	Before Training		After Training		Difference Between		First Time		Second Time		Difference Between	
	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
1	92	99	92	99	0	0	88	91	88	91	0	0
2	90	96	89	94	− 1	− 2	87	87	88	91	+1	+ 4
3	88	91	90	98	+ 2	+ 7	87	87	82	56	−5	−31
4	88	91	91	96	+ 3	+ 5	84	70	84	70	0	0
5	77	32	86	81	+ 9	+41	77	32	81	50	+4	+18
6	73	21	78	36	+ 5	+15	74	23	73	21	−1	− 2
7	50	3	90	96	+40	+93						
Total	558	433	616	600	+58	+167	497	390	496	379	−1	−11
Average	79.7	61.8	88	85.7	+ 8.3	+23.8	83	65	82.6	63.2	−.16	− 1.8

Note: Negative numbers indicate a decrease in score or rank for the experimental group after training period. In the case of the untrained group the negative numbers indicate a decrease in score or rank the second time.

the experimental group has a total rank increase of 167 or an average rank increase of 23.8 following training, while (4) the untrained group decreases eleven points or an average rank decrease of 1.8 between testing for the first and second time.

The five tests in pitch shown in Table III were given during the following periods respectively: (1) before training either pupil; (2) after the perfect fifth, perfect fourth, and major sixth had been learned; (3) after the learning of the minor sixth, diminished fifth, major and minor thirds and the octave; (4) after the pupil had substituted technical musical names for their associated terms; (5) after training with the Whipple forks had been completed.

It will be observed in Table III that Mr. Y shows a decline in the third test. This was probably due to the period of no training caused by the intervening Easter vacation. The question as to the permanence of the effect of training is thus raised. The experimenter hopes to obtain data on this point by retesting at a later date some of the pupils who have received training.

TABLE III

SCORES AND RANKS MADE ON THE SEASHORE TEST BY THE TWO PUPILS ESPECIALLY DEFECTIVE IN PITCH

Test	Miss X		Mr. Y	
	Score	Rank	Score	Rank
1	62	6/Before Training	53	3/Before Training
2	80	45/During	68	12/During
3	88	91/Training	61	5/Training
4	87	87/Period	68	12/Period
5	89	94/End of Training Period	71	17/End of Training Period

After Miss X had taken the third test, the writer was surprised to discover that the pupil was able to match vocally the tones played at the piano. He had at various times attempted to have this pupil reproduce tones in this manner but had been unsuccessful each time. Miss X asserted that she had never sung a note in her life and was unable to match vocally the tones struck on the piano. However, after a training period represented by the third test was completed she had no difficulty in reproducing any of the tones providing they were within her

vocal range. The writer was finally able to train the subject to sing the A major scale in ascending and descending order without the aid of the piano.

We see from Table III that Mr. Y does not show as great an improvement as Miss X although both received identical training. The two rank about the same in intelligence, both being in the same decile. Mr. Y's interests were diverted into other fields during the time of training and he probably was not as greatly interested in music as Miss X, who majored in that field and was receiving supplementary training throughout the course of this experiment.

The fact that she is in the field of music suggests more native ability than that of the other student. Whether the difference in the result of training the two students is to be explained in terms of difference of interest, supplementary musical experience during the period of the experiment, or native ability cannot be stated.

SUMMARY AND CONCLUSIONS

The Seashore test of pitch was given to fifty-eight students in music. The six students having the highest scores and the seven having the lowest scores were used as subjects in the subsequent experiment. The experimental group, comprising four of the highest and three of the lowest, was given a period of training in pitch by an indirect association technique, after which the Seashore test was given again to both the experimental and control groups.

Two students found to be especially deficient were given intensive training over a period of six months.

(1) The experimental group showed an average gain of 8.3 points in the Seashore test of pitch after training. (2) The control group showed an average loss in points of .16. (3) The two special students gained 88 and 14 points respectively in rank.

HANDWRITING AND EXTRA-CURRICULAR ACTIVITY

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I PROBLEM

THE problem treated in this study is: To determine what relationship, if any, exists between campus extra-curricular activity and certain graphological elements. The historic background of character prediction based upon handwriting has been so often treated that it will not be reviewed here (11) (18) (22).

II THE EXPERIMENT

The subjects for this experiment were one hundred upper-class men and women of Indiana University, Bloomington, Indiana. These subjects included fifty-nine men and forty-one women, selected through the Office of the Deans as representative of the student body. There were seventy-seven individuals enrolled in the Arts and Sciences school, including pre-medics, pre-laws, and candidates for teacher's licenses. There were five persons in the school of music and eighteen in the school of Business Administration.

These subjects were divided into three groups for each sex on the basis of extra-curricular activities rated according to the Blue Key (National Honorary College Service Fraternity) point system, modified to include women's activities. Both the men's inactive and the men's active groups contained twenty-four subjects. The men's control group contained eleven subjects. The women's active and the women's inactive groups contained sixteen subjects each. The women's control group contained nine cases.

The standard handwriting specimen obtained consisted of a copy of the following poem, given under the ruse of a memory test:

EXACT MEMORY QUIZ

Mary had a little lamb,
Its fleece was white as snow,
And everywhere that Mary went,
The lamb was sure to go.
It followed her to school one day,
Which was against the rule,
But how was a poor lamb to know
They'd just quit Lamb for Bacon in that school?

Twelve capitals and the entire lower case alphabet are included. This plan of obtaining the handwriting copy takes the subject's mind off his writing and makes for naturalness (1).

The samples were collected under as near standard conditions as a number of individual study rooms would permit. The subject selected his own writing surface, in most cases his own desk, and used his own pen. The experimenter memorized the directions and presented them in the same manner each time. A sheet of 8 x 5½ loose-leaf, unlined, notebook paper was furnished each subject. Information concerning extra-curricular activities was obtained by having the subject check a prepared blank. A questionnaire asked handwriting system learned in grade school, reasons for changes in handwriting, and acquaintance with graphology.

III QUALITIES JUDGED

Following the suggestions of A. L. Harvey (16) qualities were selected which might be measured with protractor and ruler or might be counted. The first quality considered was alignment—whether the end of the line was higher or lower than the beginning. If the end was higher one point was credited, if it was lower one point was subtracted. The algebraic sum of the slopes of the ten lines of doggerel was considered the alignment score.

The second quality scored was slant, as averaged from the ten tall letters in the line, "It followed her to school one day," here underscored. Lines were drawn through these ten letters following the individual slant. A protractor, set parallel to the base line, gave the individual letter slants, which were averaged for

the mean slant. The average deviation of each letter from this mean slant was then computed.

The eight capital letters in the selection and the twenty-six letters of the alphabet formed the basis of the next score. A letter form chart (27) was considered the guide to standard forms, and Ayer's (2) scale was used to judge legibility for discriminative purposes.

The final characteristic, a graphological sign, was subjectively judged. On page 356, note 16, of "Experiments with Handwriting," Saudek (22), one of the foremost exponents of a systematic graphology, states: "The movement upwards, which, owing to uncertainty of aim, produces a bar over the 't' instead of through the stem, was regarded by graphologists of the old school as a sign of a domineering temper, of the desire to rule. All Preyer's theories of this sort of interpretation were finally refuted by Klages. He, however, admits this kind of interpretation when the cross-stroke runs parallel with the base-line only a short distance above the short letters, his argument being that such a stroke 'opposes a decisive and circumscribing force to the tendency of the hasty writing movement to soar upwards.' I was unable to confirm this interpretation experimentally, but many things seem to suggest that it is correct."

With the intention of testing experimentally the correctness of this possibility these strong low t-bars were sought subjectively in each of the one hundred samples. In all cases the size and thickness of the writing in question were considered.

IV RESULTS

A table is presented showing the results of this experiment. The groups of active and inactive students showed little difference on each one of the characteristics. Differences between group averages were in each case small. The greatest difference was found in the alignment scores, especially between those made by active, control, and inactive men. These differences were treated in terms of their standard errors (29) and were found to be statistically unreliable. The greatest possibility of a true difference was fifty-six in one hundred.

Of the one hundred cases investigated, thirty-three had con-

TABLE I

	Men as a group	Inactive men	Control men	Active men	Women as a group	Inactive women	Control women	Active women	Inactive, whole	Control, whole	Active, whole	In 100 Cases
Alignment Score	1.1694	3.0	0.8180	-0.5	1.878	2.625	1.22	1.50	1.595	1.250	0.333	1.4600
S. D. of the Alignment Score	X	6.279	6.630	5.283	X	5.753	6.106	5.43	6.70	6.26	5.49	X
Sigma (Average)	X	1.2816	1.9987	1.0783	X	1.4382	2.035	1.35	1.05	1.39	0.86	X
Mean Slant	111.91	112.12	112.9	111.25	110.35	111.48	115.50	106.34	111.86	114.07	109.29	111.27
A. D. from Mean Slant	4.7044	4.5841	5.1841	4.54	4.089	3.933	4.406	4.06	4.32	4.06	4.37	3.95
Non-School Lower Case	5.9123	5.8750	4.63	6.58	6.17	6.18	6.0	6.25	6.00	5.25	6.40	6.03
Non-School Capitals	6.2033	6.4166	5.63	5.37	6.24	6.57	6.15	5.90	6.81	5.63	5.37	6.22
Strong, Low T-Bars in 100 Cases	4	0	1	3	1	1	0	0	1	1	3	5

sciously changed their handwriting. Of these, twenty fell in the inactive group and thirteen in the active. Library work, Drawing, Shorthand, and other special training was felt to have changed the handwriting of twenty-five subjects. Although fifty-six of the one hundred subjects reported that they had neither consciously changed their handwriting nor had any special training, every person had some non-school forms, among either their capitals or small letters.

When the subjects of this experiment were divided into workers and non-workers, twenty-three workers were active while twenty non-workers were active. Of fifty-seven students falling in the inactive grouping thirty were non-workers and seventeen were workers. Work is here considered any employment aimed at self-support.

V SUMMARY

One hundred Indiana University upperclass men were requested to write a specimen copy of "Mary Had a Little Lamb" under conditions which made for normal handwriting. Three groupings (active, control, and inactive) were made on the basis of personal reports of extra-curricular activities scored according to the Blue Key point scale. Averages of five qualities of handwriting, measured objectively, were taken, and one graphological sign was sought. No significant differences were found. The greatest difference, between the alignment of active and inactive men, is only fifty-six in one hundred (29).

TABLE II

Reliability of the Difference between Averages:

	Difference	Sigma (Difference)	D/Sigma (Difference)	Chances in 100
Between active men and inactive men in alignment:	0.2033	1.1674	0.1216	55
Between active women and inactive women in alignment:	0.08	1.979	0.040	52
Between active group and inactive group as a whole in alignment:	0.1912	1.350	0.1416	56

VI CONCLUSIONS

1. For upperclass students of Indiana University the handwriting characteristics studied are not related to campus extracurricular activity.

2. Active, control, and inactive subjects have relatively the same variability in each of the five characteristics.

3. The characteristic of alignment shows the greatest intergroup difference, but this difference is not statistically significant.

4. Only 33 per cent of the group have consciously changed their handwriting; nearly 25 per cent have been changed by professional needs; 56 per cent report they have not changed from the system taught in school, but all subjects had some non-school forms in their handwriting.

5. Only one subject in 100 knew anything about graphology and this person had not consciously changed her handwriting.

6. The average scores for active, control, and inactive groups as a whole is almost the same as the average scores for those same groups divided as to sex.

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UNITED STATES EDUCATIONAL DIRECTORY FOR 1935

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A STUDY OF THE NEEDS OF ADULTS FOR FURTHER TRAINING*

M. R. TRABUE and BEATRICE J. DVORAK

"One of the most frequent suggestions heard in recent years is that the unemployed should be given further training. Adult education, we have been told, is the solution of the difficulty. Perhaps it is. If so, what kind of training should it be? Should the unemployed person be trained to assume a philosophical attitude of resignation to his fate? Should he be taught nothing more than to enjoy his freedom from labor, or should he be prepared to go back into the industrial field to earn his own pleasures and comforts? To what extent is it possible and desirable to provide further occupational training for adults?

"In planning its part of the work of the Employment Stabilization Research Institute, University of Minnesota, the Committee on Individual Diagnosis and Training formulated these three major objectives: '(1) To test various methods of diagnosing the vocational aptitudes of unemployed workers; (2) to provide a cross section of the basic re-education problems of the unemployed; and (3) to demonstrate methods of re-education and industrial rehabilitation of workers dislodged by industrial changes.' . . .

"The data regarding adults who were judged to need training may be summarized as follows: 1. Those who needed further training had already received a greater amount of general academic education than had those who did not need it. 2. Those who needed further training were somewhat younger than those who did not. 3. Unemployment among those who needed further training was more often the result of personal than of economic factors, inadequate training and unwise choices of occupation having been among the most important personal factors. 4. Physical disabilities affected the train-

(Continued on page 848)

*Editor's Note:

In our judgment the investigations carried on by the University of Minnesota Employment Stabilization Research Institute are so timely and significant that we have written for permission to reprint parts of their various publications. The present one is taken from the University of Minnesota Bulletin, Vol. III, No. 3, July, 1934, published by the University of Minnesota Press.

A UNIFORM METHOD OF PRESENTATION FOR THE LINCOLN HOLLOW SQUARE FORM BOARD WITH TENTATIVE NORMS

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THE Lincoln Hollow Square form board was first described by Dearborn, Shaw and Lincoln[1] and later standardized by Lincoln.[2] Their directions provide that the examiner hand to the subject the pieces for each separate problem as he instructs him to fill up the "hole," but the position of the pieces with reference to each other is not prescribed. In order to eliminate the element of chance inherent in a haphazard presentation of the pieces and to insure an arrangement of pieces representing equal difficulty for all cases, a method of uniform presentation had been worked out by one of the writers and was used in all cases for this study.

The directions for this presentation, illustrated in Figure 1, are as follows:

All pieces for a given subtest are placed flat on the table, at the right of S (if he is right-handed), or at the left (if he is left-handed).

Except in the case of test 1, pieces 1, 2, 7 and 8 are placed parallel to that edge of the table which is nearest the subject. The acute angles of 7 and 8 are never pointed in opposite directions.

Test 1. Two of the 1 pieces are placed parallel to each other and to the edge of the table with the third lengthwise between them.

Test 2. 1 and 2 are placed parallel to each other.

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[1]Dearborn, W. F., Shaw, E. A., and Lincoln, E. A., A Series of Form Board and Performance Tests of Intelligence, *Harvard Monographs in Education*, 1923, Series 1, No. 4, pp. 32, 33.

[2]Lincoln, E. A., Tentative Standards for the Lincoln Hollow Square Form Board, *J. Appl. Psychol.*, 1927, 11, 264-267.

Test 3. The larger right angle triangle (5) is placed above the smaller (6), their longest edges nearest S; 8 is below with the shorter of the two long edges nearest S.

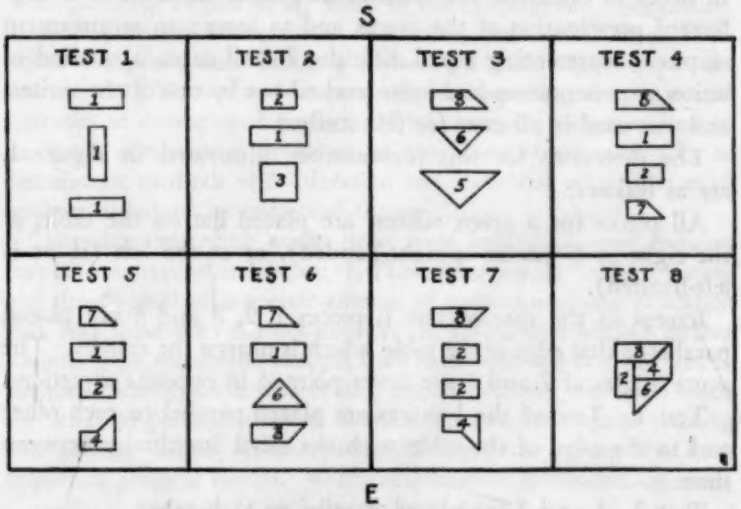
Test 4. 1 and 2 separate 7 and 8; the latter are arranged so that one of them will have to be turned over before the solution can be reached.

Test 5. 1 and 2 separate 4 and 7; the latter are so arranged that they cannot together form a square until one or the other has been turned over.

Test 6. 1 and 6 separate 7 and 8; the latter are arranged in such a way that the shorter sides of the acute angles are not parallel.

Test 7. The two 2 pieces separate 4 and 8; the latter are so placed that they cannot fit into each other until one of them has been turned over.

FIGURE 1.



Test 8. All pieces are shifted from the hollow square, relative positions remaining undisturbed; then one of the 2 pieces is removed, and the right angle of 6 is slipped into the space left vacant.

Except in the case of test 1, the presentations in Figure 1 are illustrative only.

More than 570 cases between the ages of 3 and 12 inclusive (of which approximately 60 per cent were boys) from the Neurological Clinic of the Washington University Clinics and the Child Guidance Clinic in St. Louis were used in this standardization. In handling the data two sets of distributions were considered, distributions of total time scores by chronological ages for all cases with Stanford-Binet IQ's between 90 and 109 inclusive, and distributions of total time scores by mental ages. This is essentially the method proposed by Lincoln except that the distributions of total time scores by chronological ages for all cases were omitted. This series of distributions was omitted because the group varied from an average one at the lower ages to a predominantly below average one at the higher ages, a circumstance which would distort the significance of the medians drawn from this series.

The medians of the two series of distributions are set down

TABLE I

Median total time for the separate groups by age

Age	C. A., 90-109 IQ			Mental Age		
	N	Seconds	Diff.	N	Seconds	Diff.
3.5	8	395		34	379	2
4.5	22	360		89	364	− 1
5.5	28	306	17	97	333	−11
6.5	44	305	5	130	293	− 8
7.5	44	265	−35	94	273	−46
8.5	30	228	− 5	62	242	−33
9.5	16	225	−45	34	193	− 9
10.5	13	206	−31	22	179	− 6

TABLE II

Proposed Standards

Age	Seconds	Diff.	Age	Seconds	Diff.
3.5	385	5	7.5	270	−40
4.5	360	0	8.5	235	−25
5.5	320	0	9.5	210	−25
6.5	300	−10	10.5	190	

and compared with Lincoln's in Table I. The norms presented in Table II were derived by averaging the two series and were smoothed for convenience in scoring. The differences expressed

in Tables I and II are Lincoln's medians and his proposed standards minus those of the present writers.

The correlation between Hollow Square total time and mental age for 573 cases between the ages of 3 and 12 inclusive was $.672 \pm .015$. Correlations were made for the 216 cases (between the ages of 3 and 12 inclusive) of the IQ 90 to 109 group between chronological age and score (in seconds) for the whole test and for each of the subtests. In the latter correlations failures were counted as a single class. Chronological age and total time gave a correlation of $.664 \pm .026$. The subtests one to eight gave correlations with chronological age of $.30 \pm .04$, $.42 \pm .04$, $.42 \pm .04$, $.50 \pm .03$, $.53 \pm .03$, $.32 \pm .04$, $.39 \pm .04$, $.21 \pm .04$ respectively. The number of cases involved is too small to justify basing on these correlations a system of weights for the subtests. The fact that only 28 of the 216 cases passed test eight may account for the low correlation between this subtest and chronological age; with a longer time allowance or with older subjects subtest eight might well be found to have more value. These correlations show that the ability measured by the Hollow Square as a whole and by each of its subtests increases with chronological and mental age. A final standardization will necessitate the use of more cases of IQ 90 to 109 and should include a longer time limit for test eight.

SYLLABIC LENGTH, RECOGNITION AND IMMEDIATE RECALL

An Experimental Study

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THE controversy concerning the significance of enumerating the syllabic length of words and sentences as an objective method of studying rhetorical style induced the writer, during an informal discussion of this subject, to apply to the problem a psychological principle involved in the phenomenon known as the "span of attention," and led to the study herein presented.

Although Ewbank [1] indicates that the enumeration of syllabic length was first used many years ago as an objective method of studying literary style, its recent application has been due largely to the section on *Word Length* in Chapter III of Edith Rickert's book, *New Methods for the Study of Literature*.[2] If the syllabic length of words and sentences is significant, it must be so because of its effect on the efficiency of the visual stimulus pattern. Furthermore, the use of the syllable as a unit of measurement implies that the syllable is considered an important unit of stimulation in written language. Counting the various syllabic lengths of words and sentences and graphing the results provides an objective measure applicable to written language; yet, in the light of what is known about the effect of combining units on the "span of attention," the significance of the data secured by this method should be questioned. Is the syllable a unit of stimulation in reading? Before we examine the validity of this assumption, let us consider a few statements about the "span of attention" and the memory span.

Woodworth says of this phenomenon: [3]

[1] Ewbank, H. L. Q. J'l of Speech V. 17: p. 463.

[2] *Op. cit.* p. 73. University of Chicago Press, 1927, Chicago.

[3] Woodworth, *Psychology*, Henry Holt and Co., N. Y., 1921, pp. 261-2.

> ". . . . The 'span of attention' for objects of any given kind is measured by discovering how many such objects can be clearly seen, heard, or felt, in a single instant of time. Measurement of this 'span' is one of the oldest experiments in psychology. Place a number of marbles in a little box, take a single peek into the box and see if you know how many marbles are there. Four or five you can get at a single glance, but with more there you become uncertain. . . . Expose letters not making any word and he (the observer) can read about four at a glance. But if the letters make familiar words, he can read three or four at a glance. If the words make familiar phrases, he gets a phrase of several words, containing as many as twenty letters at a single glance."

Oberly [4] distinguishes between the "span of attention" and the memory span by applying the former term to the number of discrete units which can be immediately recalled without grouping; whereas memory span is applied to the maximum number of discrete units which can be recalled with the aid of grouping. Humpstone is quoted by Brotemarkle [5] as saying: "Memory span is the ability to grasp a number of discrete elements in a given moment of attention and reproduce the same immediately." It is well established that isolated letters representing discrete units, can become through grouping, larger discrete units recognized as words, conventional language syllables, or simply nonsense syllables. Conventional language syllables can be grouped to form recognizable words and words may be combined into phrases which apparently serve as units of stimulation. Whether this phenomenon is due to the "span of attention" or to the memory span is immaterial to this discussion. However, although the syllable represents a discrete unit and serves as a pronunciation unit in spoken language, it is not the basic unit of written language because it is not the smallest indivisible unit; nor is it the unit of recognition for meaningful written language.

Does the number of syllables in a printed word affect its im-

[4] Oberly, H. S. "Comparison of the Spans of Attention and Memory" American J'l Psych. 40: 295-302.

[5] Brotemarkle, R. A. "Some Memory Span Problems." Psych. Clinic 15: 251.

mediate recognition? Can we recognize monosyllables more readily than we can polysyllables? The facility with which we come to recognize polysyllabic words indicates that words tend to become discrete units when we have learned to recognize them as such. If this unitary characteristic for the longer words persists in an experimental study of the number of such units that can be recognized and immediately recalled, then the syllabic length evidently does not affect the merits of a word or a sentence (by virtue of its representing a unit of stimulation) as a visual stimulus.

However, it is not the use of syllable counting in studying literature as a whole that is questioned: specifically, it is its use in a study of oral style. Admitting that the syllable is a unit of pronunciation in spoken language, the question is: Does the number of syllables in a word or an utterance affect its efficiency as an auditory stimulus? Let us consider the relation of the syllable to the units into which spoken language can be analyzed.

The smallest unit in spoken language is the speech sound. The next larger element is the syllable, which may consist of from one to six sounds; the next larger unit is a word of two or more syllables. It is apparent that words may be combined in phrasal groups to form in turn larger discrete units, larger particularly because they are composed of many of the smaller units and provide a pattern of stimulation of longer duration than the shorter word or single sound spoken in a conventional manner, although the response aroused by the spoken phrase may not be any more complex than that required by a word of one syllable. That familiar polysyllabic words composed of many speech sounds become discrete units is common experience to almost everyone. Sometimes we are so completely unfamiliar with the sounds that make up a word that we encounter difficulty in pronouncing it, yet we recognize the word readily every time we hear it. It is practically axiomatic that this combining of speech sounds into syllables, syllables into words, words into phrasal units, occurs for spoken language as well as for written language. Apparently familiarity with the combination of sounds is all that is necessary for the recognition of the word or phrasal group or sentence. After having learned, or having been conditioned to, certain combinations of sounds we recognize them as the words the sounds

represent. Yet we can be induced to pronounce the familiar word *machinery* when it is spelled for us with certain letters grouped together as *MacHinery*. Or, some of us may have been fooled with the well known word *rathole* when it has been spelled for us. In these cases recognition failed because the letters presented in the spelling of the words are not true phonetic symbols but may represent more than one speech sound; hence, the letters could be grouped by the speller to suggest combinations which did not exist. However, these illustrations indicate that recognition makes discrete units out of several speech sounds as readily as it makes a word out of several adjacent letters.

In an attempt to determine the effect of the syllabic length of words on their recognition and immediate recall an experimental study was planned. Only one study [6] dealing with auditory stimuli in the form of syllables could be found and this did not deal with the effect of syllabic length on recognition and immediate recall, although it employed *digits, three-letter words, syllables* in connected material, and *ideas* in a paragraph as auditory stimuli.

I. WRITTEN RECALL PHASE

The Problem

Does the syllabic length of words affect the number that can be recalled immediately after auditory presentation? Decision was made to use words of five syllabic lengths, which because of the individual variation in memory span were to be presented in homogeneous syllabic length groups each containing from three to seven words. The responses were to be written immediately after each stimulus group was presented.

SELECTING THE WORDS

In order to assemble words as nearly as possible equally familiar, they were selected from those that were found twenty times in the literature examined for Thorndike's *Teachers Word Book*.[7] Since twenty-five, the number required for each syllabic length, of this class were not available for the three, four, and five syllable

[6] Brotemarkle, R. A. *Op. cit.*

[7] Thorndike, E. L. *Teachers Word Book, The* Columbia University 1921.

words, others appearing more or less frequently were selected.

Two arrangements, one the reverse order of the other, were made of the twenty-five words in each group. Every possible care was exerted to avoid groupings that provided sequential association. Each arrangement provided for each syllabic length five different sized word groups ranging from three to seven words.

The subjects, 192 in number, were members, except for an Extension Division Class in Voice Training, of Sophomore Speech Classes in Fundamentals of Speech which met at various hours during the day. Their responses were obtained during class periods. The order in which the two arrangements of the words were presented was varied from one class to another, as was the word group presented first.[8] Since both arrangements were presented to all the Ss, the data can be considered as representing twice the number of subjects used. After a list of the words of one syllabic length had been presented, the Ss wrote the words they could recall in examination blue books.

The following directions were given each group:

"I am going to read to you, from the back of the room, several groups of words varying in size from three to seven words. In each group will be lists of words of five syllabic lengths. Rest the elbow of your writing arm on the arm of your chair, holding up your hand so that it shows over your shoulder. After I have concluded a list of words, write as many of them as you can recall, regardless of the order in which they were given. When you have written all you can recall, return your writing hand to the starting position. Do not become excited or concerned if you are unable to recall all of the words; however, do the very best that you can. Please do not look at your neighbor's paper. The results of this study will not affect your grade in this course. Are there any

[8]In one class the presentation would be begun with the three word group monosyllables of one arrangement and the other arrangement would be started with the five syllable words in the seven-word group. In the next class the seven-word five syllable words of the first arrangement would be given first. Also, each succeeding word group was begun with a different syllabic length. This variation of presentation order should have distributed any advantage or disadvantage which might have resulted from the order of presentation.

questions? (If there were any, they were answered.) Ready for the first list in the three word group. The words are:"

The Ss were allowed five seconds in which to write each of the words in a list. When that time had expired, they were told, "Prepare for the next list in the three word group. The words are:" The words were presented one after the other in a calm manner; inflection was reduced to a minimum; the tone, though moderately enthusiastic, was only loud enough for everyone in the class to hear clearly.[9]

THE DATA IN THE WRITTEN-RECALL PHASE

In studying the individual responses for the five syllabic lengths in the different sized word groups, two measures of distribution were computed, Average Deviation and Standard Deviation, and one measure of reliability, the Probable Error of the Mean. These data have been omitted from this article because the Differences between the Means of the various syllabic lengths are insignificant, for, at no time is a Difference greater than two times its P.E.$_D$., which, in order to be reliable, should be at least three times its P.E.$_D$.

However, to show the advantage the one and two syllable words might have had were it not for the words that evoked responses omitting and substituting beginnings and endings, a table was prepared to represent the responses to the words of the different syllabic lengths to which was added those partially correct responses (those omitting or substituting beginnings or endings). In this arrangement of the data the advantage of the words of one syllable over those of four and five syllables becomes significant in the six word group. Here the Difference between the Means is slightly more than three times its P.E.$_D$.—58: 16.17—

[9] In the oral presentation of stimuli wide variation may occur in the effectiveness from day to day and from hour to hour. In the presentation of these words grouping was avoided and, as far as possible, equal loudness was given each of the words. E believes that the potential variables were well under control, although some variation in the stimuli did occur. However, this variation should affect all of the syllabic lengths equally. Of course, poor production of the words would affect those of one and two syllables to a greater extent because the quantity of stimulation provided by them is relatively less than that provided by the longer words.

for the one syllable-five syllable Means and three times for the one syllable-four syllable Means. In the seven word group the Difference is more than four times the $P.E._D$ for the one syllable-five syllable-Difference. This advantage to the one syllable words ignores the time required for writing the responses.

From these data it is apparent that Ss in an Audito-Immediate-Written-Recall experiment with different syllabic length words as stimuli, are able to score a higher average recall for the one and two syllable words than they can for the three, four, and five syllable words, although the advantage is insignificant except when the partially correct responses are counted among the correct.

The uncontrollable variable, the time required for recording the responses for the different syllabic lengths, made necessary further investigation employing a type of response which would eliminate it.

II. THE RECOGNITION PHASE OF THE STUDY

The twelve words of each syllabic length which had scored the fewest substitutions in the Written-Recall phase were selected from the twenty-five used and arranged in five stimulus groups, three of which presented two words of each syllabic length, ten in all, and two which contained fifteen words each, three of each syllabic length.

In this phase of the study the presentation of the stimulus words was standardized by making an electrical transcription of them. The directions were presented on the record and the time allowed for checking the words recognized on the check list was governed by including it on the record. The check list sheet was turned face downward during the presentation of the words. When the end of the list was reached, the Ss were told to turn over their papers and check the words recognized in the appropriately numbered list. When the time allowed for checking had elapsed, they were instructed by the record to turn over their sheets and prepare to listen to the next list.

The following directions were given on the records: "I am going to read you several lists of words. After a list has been read, turn over your check sheet and put check marks to the

right of the words appearing in the list that you recognize as having been read. This is list number one of Part A. The words are . . ." When the list was concluded, the directions were: "Turn over your check sheet and check the words recognized in list one, Part A." At the end of the allowed time, the record said, "Turn over your check sheet and prepare for list number two. The words are . . ."

The preliminary directions were recorded at the beginning of both the ten and the fifteen word stimulus groups so the order of presentation was changed from group to group.

Table I gives the check lists provided for the responses of the Ss. The stimulus words are indicated by the numbers in Column 2 which show the order in which the words appeared in the stimulus list. Column 3 presents the figures showing the number of times each word was checked, indicating that it was recognized as one of the words heard in the stimulus list. The data in Column 4 belong to a third phase of this study. One hundred one subjects, members of various speech classes during the Spring Quarter and first Summer Session, 1932, were utilized in the Recognition phase of the study.

Column 3, Table I shows that many words not appearing in the stimulus lists were checked as having been heard. Adequate statistical treatment of these data required that the number of a syllabic length wrongly checked should be subtracted from the number correctly checked. When this has been done, the Means for the number checked as recognized, beginning with the one syllable words, are: 6.34; 5.81; 6.62; 5.92; and 6.47. Here again, two measures of distribution were computed, the Mean Deviation and the Standard Deviation. The reliability of the distribution of the responses was checked by finding the $P.E._M$.

The differences between the Means and the $P.E._D$ show that the three syllable words and the five syllable words have an advantage over the two syllable words and the three syllable words over the four syllable words, sufficiently greater than the $P.E._D$ to make them reliable. Two others are two and a half times as great as the $P.E._D$, the one syllable words over the two syllable words and the five syllable words over the four syllable words. The three syllable words present the highest Mean; however, this

is only 0.15 more than the five syllables, which, in turn, is only 0.13 more than the one syllable words.[10]

These data indicate that, in the recognition of stimulus words by checking the ones recognized as having been heard, no syllabic length has a marked advantage over any other length in this study. However, if the score for precision is important, the Mean for the five syllable words may not be reliable, regardless of the subtraction of those wrongly checked from those rightly checked.

TABLE I

Words used in the Recognition Check Lists in Recognition Phase of Auditory Memory Span Study. Underlined words were the stimulus words

Ten Word Groups

1	2	3	4	1	2	3	4	1	2	3	4
insignificant		8		reproach		2		confusion		3	
skate	6	72	1	remark	10	90	24	population		26	
philosophy		7		forever		1		educational		32	
basin	7	43	3	multitude	9	91	18	hood		8	
realize		3		inferior		14		cabin		9	
privilege	8	58	5	occupation	8	79	14	twinkle	6	39	2
furnace		3		economical		2		borne	7	66	17
development	9	62	18	laboratory	7	87	23	organization	3	60	11
frail		3		communication		18		secretary	9	85	23
university	10	99	31	mirth	6	88	7	delightful	10	78	19
irresistible		8		solve		5		fortunate		8	
spice	1	54	3	bridle	5	38	2	principle	5	64	10
generation		17		ample		12		altogether		3	
partner	2	52	16	misery	4	71	10	capacity	4	39	4
sympathy		18		evident		3		administration		21	
disappoint	3	48	15	ceremony	3	65	5	deliberation	8	74	8
bestow		0		comparison		12		fist		14	
application	4	47	12	uncomfortable	2	64	15	shift	2	29	4
spake		16		heave		0		fallen		2	
extraordinary	5	56	9	keen	1	39	12	ahead	1	45	4

[10] Perhaps the Ss should have been admonished not to check words unless they were sure they had heard them, because the raw scores given in Table I indicate that the five syllable words aroused not only more correct responses but also more incorrect responses. The degree of precision in recognition can be indicated by dividing the number correctly checked by the number wrongly checked. The results are: three syllable words, 9.98; two syllable words, 9.79; one syllable, 6.1; four syllable, 3.34; and five syllable words, 2.92. The largest number indicates the greatest degree of precision.

Fifteen Word Groups

1	2	3	4	1	2	3	4
imagination		24		anyone		5	
examination	15	96	30	solitary		6	
victorious	14	87	13	satisfaction	15	79	12
expedition		20		investigation		63	
ignorant		2		recommendation	14	87	32
recommend	13	75	16	hare		6	
acquire		1		damp	13	61	2
beef		29		substance	12	54	4
statesman	12	51	5	coward		7	
zeal	11	62	4	encounter	11	62	11
multiplication		18		combination	10	71	3
accordingly		7		residence		13	
violence		1		congratulation	9	70	2
representative	10	68	5	intelligence		11	
flourish		3		peck	8	44	0
favorable	9	46	4	deem		13	
interrupt	8	35	7	assume		6	
thumb		2		canvas	7	39	0
torment	7	63	2	institute	6	34	4
generosity		16		remarkable	5	52	6
chick	6	90	14	chariot		5	
consideration	5	75	9	opportunity	4	41	6
miserable		20		contemporary		5	
invitation	4	65	8	constitution		36	
remainder		5		wand		5	
tradition	3	51	1	grey	3	58	4
vigor		8		cannon		7	
recall	2	56	16	renown	2	77	11
strive		5		innumerable		9	
moss	1	82	13	vanity	1	69	8

Even if additional cases were to change the Means to the extent of the P.E.$_M$, the Differences would still be too small to be significant.

III. WRITTEN RECALL TO HETEROGENEOUS SYLLABIC LENGTH STIMULUS GROUPS

What would be the effect on immediate written recall responses if stimulus groups composed of the five syllabic lengths of words were presented? An answer to this question is found in the responses of thirty-eight Ss. The recorded words used in the Recognition Phase of the study were used. The responses were written after each stimulus list of ten or fifteen words was con-

cluded. Column 4, Table I, gives the number of times each word in the stimulus groups was written as a response.[11]

The Means for the number of words written in response for each syllabic length, beginning with the one syllable words, were: 2.08; 2.34; 3.21; 3.21; and 4.76. While the number of Ss for this phase of the study is small the P.E. of the Means are also very small, indicating that further responses would not be likely to change the Means very much. The Differences between the Means of the various syllabic lengths indicate a very significant advantage for the longest words over the shorter words, and the five syllable words have a marked advantage over all the others.

CONCLUSIONS

1. On the basis of the data in this study, the syllabic length of a word does not seem to be a determining factor in the Immediate Recognition and Recall of words, for

   a. The advantage accruing to the one and two syllable words in the Written-Recall phase can be accounted for by the longer time required to write the responses to the longer words.

2. The counting of the syllabic length of words and sentences as an objective measure applied to the study of oral style introduces a quantitative measure which has no effect on the immediate intelligibility of spoken language.

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[11] Sixteen of the thirty-eight subjects were presented, the words with electrical reproduction; the others with Orthophonic Victrola reproduction, the latter being considerably less efficient than the former. Regardless of this fact there were only two words of the sixty that failed to arouse a single response, and only two that aroused only one response each. The fact that 96 per cent of the words were recalled at least once indicates that the reproduction of the words was fairly effective. However, any inefficiency in the reproduction would have a greater effect on the shorter words because the number of clues by which a word can be recognized, assuming equal familiarity, varies directly with its syllabic length. In spite of this opinion, the advantage which lies with the five syllable words is so great that all of it would not be likely to occur from poor reproduction.

SELF TESTS FOR RADIO LISTENERS

How large is your vocabulary? Are you above or below average in knowledge of geography and history? Can father and mother spell as well as son Jimmy or daughter Jane? Answers to questions like these will be provided radio listeners as a feature of the weekly program of Education in the News presented on Wednesdays at 6 P.M., E.S.T., by the Federal Office of Education.

The Office of Education announces that a series of educational self-tests will begin with the program for February 6. The tests have been prepared by Dr. David Segel, specialist in tests and measurements in the Federal Office of Education.

The series has been prepared in response to demands from listeners to the Office of Education weekly radio programs. Last December a short test in mathematical reasoning was presented over a national hook-up. As a result the Office of Education received a flood of letters from listeners asking for more tests.

One high school boy wrote in that he and his father had taken the mathematical reasoning test. The son reported 9 correct, the father 8, and the son added, "Was his face red?"

Listeners will be asked to send the results of the self tests to the Office of Education. Analysis of the test results is expected to reveal valuable information about the radio audience.

Results sent in on the mathematical reasoning test were surprising to the Office of Education officials. The test had been planned with the expectation that a normal group of adults would give the correct answers to half of the 10 questions. Reports received at the Office of Education averaged 7 right instead of the expected 5.

"Surveyors of public entertainment often face the question of the quality of their audience," said Commissioner of Education John W. Studebaker in commenting on the test series. "Information gathered by the Federal Office of Education convinces us that those who provide public entertainment are overly pessimistic about the quality of American audiences. They have swallowed the myth that we are a nation of 12-year-olds.

"This would be ridiculous if the results of the unwarranted acceptance of the myth were not so tragic. The series of self tests requested by listeners to the Office of Education radio programs may yield some interesting new evidence on the quality of radio audiences. The evidence may in turn influence the making of radio programs."

AN EXPLORATORY COURSE IN MATHEMATICS

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IF THE school administrator or the mathematics teacher can locate a course in the eighth grade through which they may predict success in algebra, they will probably be interested. If the same course furnishes a device for counseling pupils in algebra so that failures fall below 1 per cent, they will probably be intrigued. But if, in addition, the same course provides the pupil with the opportunity to discover his interests and abilities in ninth grade mathematics, the authorities most certainly should be interested, intrigued, and willing to learn.

DEVELOPMENT OF THE COURSE

A nine weeks course for the last portion of the second semester of the eighth grade has been developed at the South Pasadena Junior High School, South Pasadena, California, which accomplished the three desirable ends mentioned above. The course was started in September 1930 and has been improved through three years of trials. In June 1933 the "Exploratory Course in Mathematics" was a live and effective portion of the mathematics curriculum. Five hundred ninety pupils have taken the "Exploratory Course," and 338 of these have also completed the first semester in algebra.

ORGANIZATION OF THE EXPLORATORY COURSE

The "Exploratory Course in Mathematics" takes the last nine weeks of the second semester of the eighth grade at the South Pasadena Junior High School. Formal arithmetic instruction is closed before the exploratory course begins. The regular mathematics teachers conduct the classes in the new course. All pupils in the second semester of the eighth grade are required to take the course.

The content material is mostly algebraic, including concepts through the solving of the simple equations. Several lessons dealing with typical experiences in General Mathematics, Geometry, and Commercial Arithmetic are included. The content is significant to all pupils regardless of their future mathematics instruction.

During the course each pupil is given ample opportunity to elect a ninth grade course according to his own discoveries as to his interests and abilities. His teacher recommends the course in which the pupil will probably achieve the most. The combination furnishes the basis for effective pupil guidance in mathematics.

PREDICTING SUCCESS IN ALGEBRA

Success in algebra is measured, for purposes of this study, by marks received. Inasmuch as algebra is a one year (two semester) subject, and since the second semester mark is dependent in some degree on the mastery of the first semester, the marks in the second semester are used as the measure of success. The following measures, all taken during the "Exploratory Course in Mathematics" were correlated with the second semester marks in algebra: (1) South Pasadena Prognostic Test; (2) South Pasadena 8A Mechanics Test; (3) South Pasadena 8A Reasoning Test; (4) Teacher Estimate of Mathematical Ability; (5) Intelligence Quotient. The method of zero order, partial, and multiple correlations was used. The correlations for second semester marks and various combinations of measures are shown in Table I.

TABLE I

Correlations of Success in Algebra with Certain Measures of Prediction

Measure	Correlation	
South Pasadena Prognostic Test	.400 ± .036	
8A Mechanics Test	.375 ± .035	
8A Reasoning Test	.439 ± .041	
Teacher Estimate of Mathematical Ability	.634 ± .027	
Intelligence Quotient	.337 ± .030	
South Pasadena Prognostic Test, and Teacher Estimate	.688	(Multiple)
8A Mechanics Test and Teacher Estimate	.636	(Correlations)
8A Reasoning Test and Teacher Estimate	.634	
Teacher Estimate and Intelligence Quotient	.635	
(All other combinations of 2 measures yield a multiple correlation coefficient of less than .600)		

South Pasadena Prognostic Test, 8A Mechanics Test, and Teacher Estimate	.670
8A Mechanics Test, 8A Reasoning Test, and Teacher Estimate	.636
8A Reasoning Test, Teacher Estimate, and Intelligence Quotient	.640
South Pasadena Prognostic Test, 8A Reasoning Test, and Teacher Estimate	.704
South Pasadena Prognostic Test, Teacher Estimate, and Intelligence Quotient	.694
8A Mechanics Test, Teacher Estimate, and Intelligence Quotient	.636
(All other combinations of 3 measures yield a multiple correlation coefficient of less than .600)	
South Pasadena Prognostic Test, 8A Mechanics Test, 8A Reasoning Test, and Teacher Estimate	.690
South Pasadena Prognostic Test, 8A Mechanics Test, Intelligence Quotient, and Teacher Estimate	.641
8A Mechanics Test, 8A Reasoning Test, Intelligence Quotient, and Teacher Estimate	.698
South Pasadena Prognostic Test, 8A Mechanics Test, 8A Reasoning Test, Teacher Estimate, and Intelligence Quotient	.691

Since the highest correlation is considered the best measure for prediction of success in algebra, the combination of the South Pasadena Prognostic Test, the 8A Reasoning Test, and the Teacher Estimate of Mathematical Ability is to be used when predicting the second semester mark in algebra.

SUCCESS OF THE COUNSELING

The "Exploratory Course in Mathematics" was six weeks in length during the first three semesters of its existence, and nine weeks since then.

The success of the counseling program may be measured by the success of pupils in the subject which they are advised to take. Tables showing the marks received by pupils in algebra will furnish the objective evidence from which the reader can draw his own conclusions.

TABLE II

Marks in 9B Mathematics of Pupils Who Took the Six Weeks Exploratory Course

Mark 9B	Pupils Recommended by Math. Dept. and who took algebra		Pupils not Rec. by Math. Dept. and who took algebra		Pupils Recommended by Math. Dept. and who took general math.	
	Number	*Per cent*	*Number*	*Per cent*	*Number*	*Per cent*
1	29	20	0	0	1	2
2	49	34	8	22	13	30
3	49	34	16	43	19	43
4	16	11	9	24	8	18
5	1	1	4	11	3	7
Total	144	100	37	100	44	100

TABLE III

Marks in 9A Mathematics of Pupils Who Took the Six Weeks Exploratory Course

Mark 9A Sem.	Pupils Rec. by Math. Dept. and who took algebra		Pupils not Rec. by Math. Dept. and who took algebra		Pupils Rec. by Math. Dept. and who took general math.	
	Number	*Per cent*	*Number*	*Per cent*	*Number*	*Per cent*
1	21	21	0	0	2	7
2	37	36	1	5	8	31
3	28	27	5	24	8	31
4	12	12	10	47	8	31
5	4	4	5	24	0	0
Total	102	100	21	100	26	100

The time for the Exploratory Course was extended from six to nine weeks during the spring of 1932. Tables IV and V give the evidence for those pupils who have taken the nine weeks Exploratory Course and followed that with 9th grade general mathematics or algebra.

TABLE IV

Marks in 9B Mathematics of Pupils Who Took the Nine Weeks Exploratory Course

Mark 9B Sem.	Pupils Rec. by Math. Dept. and who took algebra		Pupils not Rec. by Math. Dept. and who took algebra		Pupils Rec. by Math. Dept. and who took general math.	
	Number	*Per cent*	*Number*	*Per cent*	*Number*	*Per cent*
1	24	25	1	8	1	6
2	47	50	2	15	16	50
3	19	20	8	61	7	22
4	4	4	1	8	7	22
5	1	1	1	8	0	0
Total	95	100	13	100	32	100

TABLE V

Marks in 9A Mathematics of Pupils Who Took the Nine Weeks Exploratory Course

Mark 9 A Sem.	Pupils Rec. by Math. Dept. and who took algebra		Pupils not Rec. by Math. Dept. and who took algebra		Pupils Rec. by Math. Dept. and who took general math.	
	Number	*Per cent*	*Number*	*Per cent*	*Number*	*Per cent*
1	17	27	0	0	0	0
2	22	36	3	33	5	30
3	21	34	0	0	5	30
4	2	3	3	33	7	41
5	0	0	3	33	0	0
Total	62	100	9	99	17	101

Thus the counseling program as evolved through the Exploratory Course has resulted in only 1 failure in 95 who completed first semester algebra and none in the 62 who completed second semester algebra. No failures in either semester of general mathematics occurred for the 49 pupils who completed either the first or second semester of the subject.

THE EXPLORATORY COURSE IS FOR MODERN SCHOOLS

The Exploratory Course in Mathematics is designed for up-to-date progressive schools which have an eighth grade. The philosophy which permeates the junior high school and the upper elementary school calls for the exploration of the pupils' interest and ability through actual experiences. The Exploratory Course furnishes such an opportunity.

The Exploratory Course will cause a reorganization of the purely arithmetic instruction into a nine weeks shorter period. Much of the material of the new course consists of formulae and equations based on concepts usually dealt with in second semester eighth grade work. The material of the Exploratory Course however is considered more significant in the mathematical education of the pupil than the materials of the traditional arithmetic course of study.

The Exploratory Course takes mathematics from the traditionally formal instruction to a parity with the newer subjects in the progressive outlook. Whereas counseling in mathematics was practically non-existent, the Exploratory Course provides a device that is truly effective.

A STUDY OF THE NEEDS OF ADULTS FOR FURTHER TRAINING

(Continued from page 826)

ing problem of about one man in every five and of about one woman in every ten. 5. Those who were judged to need training had somewhat higher average scores than the average adult on the tests used, and the differences discovered between the group of persons who took training and the group who were not offered training were not large.

"Three distinct methods were used in the effort to provide further training for the unemployed adults studied by the Employment Stabilization Research Institute. The first was an attempt to use the educational agencies already operating in the three Minnesota cities in which unemployed adults were being studied; the second was an attempt to develop special agencies for training factory workers; and the third was an attempt to develop new techniques for training office workers. . . .

"More than three-fourths of the training results confirmed positively the recommendations made before the training was undertaken. Two-thirds of those who were given training along lines other than those indicated by an occupational analysis were unsuccessful in their courses, and fewer than 5 per cent were successful. On the other hand, more than three-fourths of those who took the training recommended were successful, and fewer than 6 per cent were unsuccessful. . . .

"These results of training experiments should be considered in connection with the findings as to the kinds of adults who were found to need training. Those who were found to need training in order to achieve occupational success were already better educated in the ordinary academic sense than were those who did not need training. Instead of helping people to discover their vocational aptitudes and needs, our high schools and colleges may, according to certain indications in this report, actually be contributing to the occupational maladjustments of a considerable number. Information about himself and about the occupational fields for which his characteristics qualify him evidently contributes more to the economic and vocational success of the average adult than additional general education, for without such information the training he may take is almost as likely to injure as to improve his occupational efficiency.

(Continued on page 861)

A STUDY OF SIX STANDARDIZED CIVICS TESTS FOR USE IN THE SECONDARY SCHOOLS[1]

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THERE is quite general agreement among authorities in tests and measurements that the determination of pupils' civic information and civic attitudes is difficult.[2] The subject of civics presents unusual difficulties for the test maker, since the content of civics tests must be wider than is denoted by the narrow meaning of the term. Indeed, Odell has pointed out that half or more than half of the available tests in this field are not at all limited to the operations of government and to citizen participation in government, but that the tests include items drawn from what might be termed "citizenship" in a rather broad sense.

This discussion reports data concerning only the validity and the reliability of six standardized tests in civics. Validity has been defined as the correspondence between the ability measured by a test and the ability as otherwise objectively defined and measured. "When a test really measures what it purports to measure and consistently measures this same something throughout the entire range of the test, it is a valid test."[3] Odell writes concerning reliability:

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[1]This discussion is based upon a master's thesis, prepared at the University of Southern California under the direction of Dr. A. S. Raubenheimer.

[2]L. W. Webb and A. M. Shotwell, *Standard Tests in the Elementary School.* New York: Ray Long and Richard R. Smith, Inc., 1932. Page 420.

P. M. Symonds, *Measurement in Secondary Education.* New York: The Macmillan Company, 1927. Page 179.

C. W. Odell, *Educational Measurement in the High School.* New York: The Century Company, 1930. Page 290.

[3]W. A. McCall, *How to Measure in Education.* New York: The Macmillan Company, 1923. Page 195.

Reliability is synonymous with accuracy. The reliability of a test may be defined as the degree to which a second application yields scores equivalent to those obtained from the first application. A second application may refer either to giving the identical test again, or using a duplicate and equivalent form thereof. It should be noted that this definition does not state that the same scores must be yielded by the second application as by the first, but only that they must be equivalent or, in other words, that a known uniform relationship exist between those obtained at the two testing periods.[4]

The tests which were used in this study include the following measuring instruments:

1. The Brown-Woody Civics Test, Forms A and B.[5]
2. The Burton Civics Test, Forms A and B.[5]
3. The Hill Test in Civic Attitudes.[5]
4. The Hill Test in Civic Information.[6]
5. The Almack Test of American Civics and Government, Forms I and II.[7]
6. The Magruder-Clinton-Chambers Test in American Government, Forms A and B.[7]

The tests were administered to approximately one hundred thirty pupils in grades 11A and 12B, all of whom were registered in civics classes in the Grossmont Union High School. Only one hundred eight pupils responded to all of the forms of all tests. The testing program was completed in eight school days between December 1 and 15, 1932. Tests with duplicate forms were administered twice, each form once, and so timed that no great time interval elapsed between the giving of the two forms. The two Hill tests, one form only for each, were given only once. The tests were scored by the writer and this scoring was checked to insure accuracy. All statistical tabulations and computations were checked twice to insure accuracy.

The correlation technique was employed in evaluating the reli-

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[4] C. W. Odell, loc. cit., page 59.

[5] Published by the World Book Company, Yonkers-on-Hudson, New York.

[6] Published by the Public School Publishing Company, Bloomington, Illinois.

[7] Published by the C. A. Gregory Company, Cincinnati, Ohio.

ability and the validity of the tests, although certain additional measures of reliability were computed also. This procedure was thought to be satisfactory in studying the validity of the instruments, since each of them had some claim to validity due to its standardization. Table I includes all intercorrelation data.

TABLE I

Measures of Relationship Between the Several Score Distributions. N is 108. P.E.r varies between 0.022 and 0.054.

	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10) Magruder, B
1) Hill CA	.480	.485	.517	.488	.496	.526	.419	.470	.491
2) Hill CI		.639	.529	.513	.524	.597	.604	.498	.468
3) Brown-Woody, A			.756	.584	.562	.523	.647	.738	.695
4) Brown-Woody, B				.577	.580	.590	.637	.695	.662
5) Burton, A					.522	.493	.492	.488	.474
6) Burton, B						.559	.446	.560	.472
7) Almack, I							.632	.713	.680
8) Almack, II								.734	.736
9) Magruder, A									.812

Data on the reliability of the several tests are given in Table II. The reliability coefficients for the two Hill tests were obtained by re-scoring these tests, one-half versus one-half, and then applying the Spearman-Brown technique.

TABLE II

Measures of the Reliability of the Six Standard Tests, 108 cases.

Test	r1I	P. E. meas	P. E. meas M	P. E. meas SD
Hill Civic Attitudes	.560	1.12	.06	.43
Hill Civic Information	.604	.91	.07	.45
Brown-Woody	.756	4.08	.03	.33
Burton	.522	1.92	.04	.47
Almack	.632	2.71	.05	.41
Magruder and Others	.812	4.00	.05	.29

Kelley says that minimal satisfactory reliabilities as measured by a reliability coefficient from the pupils in a single school level are positive 0.94 with reference to the measurement of the past

general scholastic success and the future promise of an individual.[8] Odell says that ratios of the probable error of measurement to the mean and of the probable error of measurement to the standard deviation should be 0.04-0.05 and 0.16-0.22 respectively to compare with reliability coefficients of 0.90-0.94.[9] Ratios of the probable error of measurement to the mean of 0.06-0.08, and of the probable error of measurement to the standard deviation of 0.23-0.30, are satisfactory in instances of group measurement, but are only fairly so for individuals. In view of these facts it is obvious from even a casual consideration of the data in Table II that only the Brown-Woody and Magruder and others' tests approach satisfactory reliability for use in senior high school civics classes.

It is interesting to find relatively close agreement between the reliability data quoted above and that reported elsewhere by other writers. Odell reports data for the Hill Civic Attitudes Test, as follows: $r_{11} = .60$; P.E.meas/M = .05; and P.E.meas/SD = .42.[10] The authors of the Brown-Woody test, in the test manual, give the reliability coefficient of the test as 0.92 (N is 600). The Burtons similarly report the reliability, Form A versus Form B, described by a coefficient of 0.78. Odell also reports data for the Almack test, as follows: $r_{11} = .91$; P.E.meas/M = .08; and P.E.meas/SD = .20.[11] The authors of the Magruder and others' tests discovered a reliability coefficient of .85 (N is 240) for their test. These data offer no evidence tending to change the significance of the conclusions cited in the paragraph above.

Insofar as the validity coefficients are concerned, we may with safety suggest that validity coefficients should be at least positive 0.60 at the minimum (60 agreements per 100 cases), since the criteria, other standardized tests in civics, have a definite claim to validity due to their standardization. If we consider the values of the different validity coefficients, we find the order of excellence to be (1) Brown-Woody, (2) Magruder, et al, (3) Almack, (4)

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[8] T. L. Kelley, *Interpretation of Educational Measurement*. Yonkers-on-Hudson, New York: World Book Company, 1927. Page 29.

[9] C. W. Odell, loc. cit., page 65.

[10] C. W. Odell, loc. cit., pages 292-293.

[11] C. W. Odell, loc. cit., page 294.

Hill CI, (5) Burton, and (6) Hill CA. It seems logical to suggest that at least the last three should not be used in high school civics classes.

The data given in this article should be of some value to high school teachers of civics in their selection of tests for classroom use. Findings of this sort, also, suggest that we need more studies of the sort, not only in civics (for all of the standardized tests available were not included in this research), but also in other subject-matter fields.

BULLETIN ERGOLOGIQUE

The Bulletin of the Science of Work, published by Dr. Paul Sollier and M. Jose Drabs at 21 rue des Drapiers, Brussells, Belgium, contains in its April 1934 number a list of the Studies in Work Psychology made during the academic year 1933-34 under the direction of l'Ecole d'Ergologie.

The following titles indicate the wide variety and scientific nature of the Belgian researches:

I. Research in General Ergologique

a. Experimental Research on the modalities of involuntary attention by M. Audet, M.D. Involuntary would be to voluntary attention as reflex action is to voluntary action. It seems incontestable that there is a large number of adaptive responses which are nothing but reaction to a whole series of stimuli which have become specific following exercise repeated a great number of times.

There would be an advantage in knowing the type of involuntary attention of a subject, working as a chauffeur or a machinist, for example, and of determining to what degree his involuntary attention would be able to supplement his voluntary attention if the latter becomes momentarily diminished through exogenous or endogenous causes.

b. The devising of a spirographic process (the Sollier-Drabs Volumetric Spirograph) making it possible to measure energy dispensed during work by a very simple and practical method, by M. Theo De Smet, Dr. Buyse and M. Dumoulin. The last named has interested himself particularly in research concerning:

c. The type of respiratory mask which gives the least annoyance to the workman during the spirographic experiments.

d. New statistical researches in the causes of accidents, by M. Scheerens.

II. Researches into Professional Selection

a. Attempting the selection of workers with colors in the textile industries, by M. Doeders. An attempt having for its purpose the construction of a series of psycho-professional selection tests for workers with textile dyes and colors to determine the degree of visual acuity ideally necessary for the best discrimination of colors.

b. Selection of Calculating Machine Operators, by M. Maes. This investigator, having determined some causes of errors among the operators of calculating machines, devoted himself to the standardization of a series of psychotechnical tests concerning the selection of these operators.

III. Research on Psychotechnical Economy

a. A study concerning the wall surfaces of workrooms, by Mlle. Desmedt. The research attempted to determine the physical criterion of cleanliness. How to secure a maximum result with a minimum of fatigue was also studied through research into the most economic movements and attitudes.

b. Research on Industrial Recovery, by M. Hahn. A study of the three current methods: Russian, German, American, in order to make more certain those which are most familiar to Belgium and to study the effects exercised in the act of buying through an announcement properly made.

Parallel to this research by the questionnaire method a study was made of the motives which led individuals to buy from reading advertisements in large-sized or small magazines.

NEWS AND NOTES

NOTE UPON DICKEY'S FORMULA FOR THE EFFECT OF RANGE UPON THE RELIABILITY COEFFICIENT

TRUMAN L. KELLEY

Harvard University

The present writer has given the formula [1]

$$\frac{\sigma}{\Sigma} = \frac{\sqrt{1-R}}{\sqrt{1-r}} \qquad [1]$$

as giving the relationship between reliability coefficients r and R consequent to different ranges of ability σ and Σ. The assumption underlying this is that the test in question is as serviceable in the one range of talent as in the other, or otherwise stated, that the standard deviation of the differences between pupils' obtained scores and their true abilities is the same in the narrow as in the wide range of ability. It, of course, has never been maintained that the formula is serviceable if this assumption is unsound.

Recently John W. Dickey [2, 3] has presented the formula

$$\frac{\sigma}{\Sigma} = \frac{1-\sqrt{R}}{1-\sqrt{r}} \qquad [2]$$

as appropriate to give the relationship between range and reliability.

Mr. Dickey claims that [2] is better than [1] because the standard error of R (knowing r, σ, and Σ) is smaller when determined from [2] than when determined from [1]. The writer claims that this consideration is entirely irrelevant as determining which is the appropriate formula, just as it would be to assert that the standard deviation is a better average than the arithmetic mean because it has a smaller standard error.

We must examine the argument underlying the derivation of formula [2]. There are two steps in Dickey's procedure which the

[1] "The Reliability of Test Scores," *Journal of Educational Psychology*, Vol. 12, May, 1921, pp. 370-79.

[2] "On the Reliability of a Standard Score," *Journal of Educational Psychology*, Vol. 21, 1930, pages 547-549.

[3] "On Estimating the Reliability Coefficient," *Journal of Applied Psychology*, Vol. 18, No. 1, February, 1934, pages 103-115.

writer would point out as unsound. They are not in his 1934 derivation but in the 1930 derivation which he uses in his 1934 article. Mr. Dickey uses the following notation:

Let,

x_1 = the deviation of a gross score from the mean of the obtained gross-score series,

σ_1 = the variability of the obtained gross scores,

$z_1 = x_1/\sigma_1$ = an obtained standard score,

r = the reliability of the test,

x_∞ = the best estimate of a "true" deviation,

σ_∞ = the best estimate of the "true" variability,

$z_\infty = x_\infty/\sigma_\infty$ = the best estimate of a "true" standard score,

ϵ = an error of estimate; that is, $z_1 - z_\infty$.

This notation is different in a very important respect from that used by the writer which is as follows:

x_1, σ_1, z_1, and r as defined by Dickey,

x_∞ = a true (unknown) deviation,

σ_∞ = the standard deviation of the x_∞'s $= \sigma_1\sqrt{1-r}$[4]

$\bar{x}_\infty = rx_1$ = an estimated true score = Dickey's x_∞,

$\sigma_{\bar{x}_\infty}$ = the standard deviation of the $\bar{x}_\infty$'s,

$$z_\infty = \frac{x_\infty}{\sigma_1}, \text{ so that } \sigma_{z_\infty} = \sqrt{1-r}$$

$$\bar{z}_\infty = \frac{\bar{x}_\infty}{\sigma_1},$$

$$z_{\infty \cdot 1} = \frac{x_\infty}{\sigma_1} - \frac{\bar{x}_\infty}{\sigma_1} = \text{an error of estimate in units of the standard deviation of the original distribution of scores.}$$

The necessity of noting the difference in our notations lies in the fact that Dickey has used a relationship, viz. $\sigma_\infty = \sigma_1\sqrt{r}$, which is correct with symbols as defined by me but not true with symbols as he has defined them. In terms of his notation it is obvious, since $x_\infty = rx_1$, that $\sigma_\infty = r\sigma_1$. This error, upon the second page of Dickey's 1930 article, is perpetuated throughout that article and also the 1934 article.

The writer would also criticize Mr. Dickey's definition of an error of estimate, which in my notation may be stated thus:

$\epsilon = z_1 - \bar{z}_\infty$.

[4] Kelley, Truman L., *Statistical Method*, Macmillan, 1924, p. 213.

Clearly the error of estimate is $(z_1 - z_\infty)$ and not $(z_1 - \bar{z}_\infty)$. The writer thus maintains that Dickey has improperly defined the error of estimate and has confused σ_∞ and $\sigma_{\bar{\infty}}$, using the standard error of the former when the latter was called for, and that as a consequence the conclusions of both of his articles are in error.

A REPLY TO KELLEY'S "NOTE UPON DICKEY'S FORMULA . . ."

JOHN W. DICKEY

State Normal School
Newark, N. J.

The writer had derived the formula [1]

$$\frac{\sigma}{\Sigma} = \frac{1 - \sqrt{R}}{1 - \sqrt{r}}$$

with the help of the formula [2]

$$\sigma_{(z_1 - z_\infty)} = 1 - \sqrt{r}$$

which was derived as a measure of the reliability of an obtained standard score when it is "taken as evidence of the best estimated 'true' standard score."

Professor Kelley's criticism of these two formulas, given in his "Note" above, reduces itself basically to two questions, namely, (a) What is a "true" standard score? and (b) What is the best estimate of this theoretical, "true" standard score? Professor Kelley's criticism of "two steps"—the expression of the error of estimate, and the expression of the variability of the best estimate of the "true" standard score—is contingent upon these two basic questions, (a) and (b). These two questions will therefore be considered.

First, (a) What is a "true" standard score? This theoretical score could be obtained if a test could be administered an infinite number of times to the same population (N). A "true" gross score

[1] Dickey, John W., "On Estimating the Reliability Coefficient," *Journal of Applied Psychology*, Vol. XVIII, No. 1, pp. 103-115, February, 1934 (hereafter referred to as, 1934)

[2] Dickey, John W., "On the Reliability of a Standard Score," *Journal of Educational Psychology*, Vol. XXI, No. 7, October, 1930, p. 457 (hereafter referred to as, 1930)

would be the mean of the infinite number of obtained scores. Each individual of the population (N) would therefore have a "true" gross score; and the mean and the sigma of these would be the "true" mean and the "true" sigma. A "true" standard score would therefore be the deviation of a "true" gross score from the "true" mean, divided by the "true" sigma. In Professor Kelley's notation, this is certainly not (x_∞/σ_1) as he maintains that it is. When an obtained standard score is taken as evidence of this "true" score, the error of estimate would therefore be, in standard scores, the difference between the obtained standard score and this "true" standard score.

Since we are unable to obtain a "true" standard score, we are obliged to answer the question (b) What is the best estimate of this theoretical, "true" standard score? The writer has used (with recognition) Professor Kelley's formulas for obtaining the best estimates of the "true" deviation and the "true" variability (1930). The best estimate of the "true" deviation is (rx_1), and the best estimate of the "true" variability is $(\sigma_1\sqrt{r})$. The best estimate of the "true" variability was used rather than the variability of the best estimated "true" scores $(\sigma_1 r)$, in order to avoid a systematic error (1930, footnote). This is a crucial point, for had the value of $(\sigma_1 r)$ been used the systematic error would have crept into the formula.

The best estimate of this error between the obtained standard score and the "true" standard score has been symbolized (1930) by the writer as

$$\epsilon = \frac{x_1}{\sigma_1} - \frac{x_\infty}{\sigma_\infty}$$

where the (x_1/σ_1) is an obtained standard score, and the (x_∞/σ_∞) is at once both the "true" standard score and the best estimate of this "true" standard score. This somewhat unconventional symbolization was implicit in the 1930 article, but the writer had failed to state it explicitly. (Such a double meaning of symbols in the statistics of "true" scores has much to commend it and a very definite place—that of representing a "true" score together with its best estimate.) Professor Kelley agrees ($\sigma_{z_\infty} = \sqrt{r}$, in his "Note" above) that the sigma of the "true" standard score is $(\sqrt{r})$. This is the sigma of the writer's score (x_∞/σ_∞). This value $(\sqrt{r})$ leads directly (see 1930 article) to my formula $(1-\sqrt{r})$.

The discussion of the above questions (a) and (b) explains why the writer's 1930 article is correct. In referring to the 1934 article,

Professor Kelley's only criticism in his "Note" is that the size of the standard error is "entirely irrelevant as determining which is the appropriate formula." In my 1934 article, I have explicitly stated that the derivation is based upon the same assumption and derived in a strictly parallel manner with Professor Kelley's 1921 formula. In addition, the writer is using logic exactly like that used by Professor Kelley in his *Statistical Method* on pp. 104-106 where he summarizes his evaluation of the measures of central tendency and dispersion based upon their measures of reliability. The writer is using therefore an accepted criterion of the word "better" when he states that his 1934 formula is better than Professor Kelley's 1921 formula.

In conclusion, the writer thus maintains that Professor Kelley has improperly derived the standard error of estimate when an obtained standard score is taken as evidence of the best estimated "true" standard score, and that my derivations (1930 and 1934) are both correct.

Errata. Mr. Harry C. Mahan wishes to call attention to certain errors in his article entitled "A Battery of Performance Tests" which appeared in the October issue of this Journal. On page 647 the weights used in the second equation were obtained by multiplying those in the first equation by $1/R$ instead of $\sigma X_7/R_{7.12345}$ as stated. R in this case happened to be .913. To make these two equations technically complete the equation sign and the symbol X_7 should be added to them as given.

In Table IV the column of weighted scores for Healy PC II should begin with .00 instead of .19. This means that the entire column should be shifted up one line, placing the weighted score of .19 opposite the raw score of 5—9, etc. This error is particularly regrettable because if it is not corrected the performance age will be .19 of a year too high.

The Woods Schools at Langhorne, Pa., recently announced a series of four lecture conferences to be held under the auspices of the Child Research Clinic under the general title, "The Scientist Looks at the Emotionally Unstable Child." These conferences will be addressed on Thursday evenings (January 24 and 30, February 14 and 28) by prominent scientists in the fields of neurology, endocrinology, psychiatry and psychoanalysis. There will be discussion at the end of each lecture.

A number of significant projects designed to give American business more complete information on domestic marketing are being undertaken by the reorganized Marketing Research and Service Division of the Bureau of Foreign and Domestic Commerce, it was announced recently by N. H. Engle, Assistant Director of the Bureau.

Valuable new data are expected to be developed under the program on the trend of consumer buying through retail stores, the costs and processes involved in getting goods from the producer to the consumer, the needs and buying habits of consumers, and the cooperative activities of industries through trade associations.

The Midwestern Psychological Association will hold its tenth annual meeting as guests of the University of Kansas, Lawrence, Kansas, on Friday and Saturday, May 10 and 11, 1935, under the presidency of Dr. John A. McGeoch. In order that a strong program may be arranged, members are urged to prepare their papers at an early date. An abstract in quadruplicate of not more than 200 words must be in the hands of the secretary, Dr. Arthur G. Bills, Department of Psychology, University of Chicago, Chicago, Illinois, not later than March 1, 1935. Those who wish to explain their papers in greater detail to the program committee may submit a supplement. In preparing abstracts, members are asked to follow the form used in the proceedings of the past meetings, published in the *Psychological Bulletin*.

To be acceptable for the program, papers should report completed work of a major character. Reports of incidental, minor, and incomplete work may be made at the session for reports from the laboratories and in symposia. Both theoretical and experimental papers will be accepted on their merits. The program committee reserve the right to reject any papers which do not conform to the specifications herein stated.

The Midwestern Psychological Association is an open organization of all psychologists who may wish to join. The fiscal year is October 1 to October 1. Dues are $1.00 a year for the year 1934-5 for all who did not pay for two years in advance last year. For members who did pay in advance the dues will be $1.00 per year beginning October 1935. If you have not already paid your dues, you are invited to do so before February 1, if possible. By action of the Council, further notices of meetings will be sent to members only. Mail checks (not currency) to Dr. Arthur G. Bills.

The attention of our readers is called to the publication of a new magazine, "Children's Activities," under the editorship of Dr. Garry C. Myers. The first issue, December, 1934, furnishes ample evidence that young children will find in this publication most interesting stories and an abundance of material for handwork, plays and games. It is the belief of the Editor of THE JOURNAL OF APPLIED PSYCHOLOGY that all parents and adults who are interested in furthering the best development of young children will do well to examine this new venture in the field of publications for children. Inquiries about subscription rates should be sent to the following address: Junior Home Magazine, D. C. Kreidler, Publisher, 1018 S. Wabash Avenue, Chicago, Illinois.

A STUDY OF THE NEEDS OF ADULTS FOR FURTHER TRAINING

(Continued from page 848)

"These experiments in the vocational training of adults suggest, therefore, that perhaps the greatest educational need of unemployed adults is for authentic information about their own vocational assets and liabilities. The grown man or woman who needs further training is frequently unaware of that need. The person who does feel a desire to secure further preparation is quite likely to be in error or in doubt regarding the occupational field in which he should seek training. His need for information along these lines cannot be met except by a comprehensive survey of his characteristics based on the most scientific devices available.

"The advantages of greater self-confidence, better integrated training programs, and less waste of energy and money on inappropriate courses might all be secured for students in any program of adult education by providing a well-organized occupational clinic. Such an agency is obviously needed in dealing with prisoners, cripples, and other specially handicapped groups, but it is equally important in dealing with adults and young people who are perfectly normal. It is probably true that less can be done for adolescent youths, and still less for preadolescents, since many of their traits have not yet fully developed and crystalized, but much good could be done, even in the public high schools, if scientifically sound guidance clinics were established.

(Continued on page 872)

BOOK REVIEWS

The Thorndike-Century Junior Dictionary. Edward L. Thorndike. 23,281 defined words; 1610 pictures; 970 pages. List price, $1.32. Scott, Foresman & Co.

Under the sponsorship of the noted educational psychologist, E. L. Thorndike, there has just appeared a school dictionary that should go far to make the dictionary what it should be but has never yet been, a ready work of reference for children in their reading, writing, and speaking. Professor Thorndike has propounded in the preface and followed in the book the very clear principle that definitions for children must be in children's language and especially adapted to the children's background of experience. The definitions have therefore a refreshing simplicity and directness. They sound like the explanations that a capable teacher would actually give children in the classroom, and follow the well-known rule that definitions for young people must be *longer* than those for adults, rather than shorter. Then, because formal definitions may still be somewhat foreign to the grade pupil's way of thinking, pictures and illustrative sentences are used most freely. One wonders how a dictionary-maker had the courage to give so much space to them, but Professor Thorndike and his assistants have shown everywhere in this book the courage of their convictions. In the arrangement of meanings, for instance, they have abandoned the historical arrangement, the oldest meaning first, and instead declare that "For them (the children) the proper principles of arrangement are: literal uses before figurative, general uses before special, common uses before rare, and easily understandable uses before difficult." They even abandon the familiar arrangement according to parts of speech and give noun, verb, adjective, or other meaning, as the case may be, in the arrangement of the most used meanings first regardless of part of speech. This plan at first appears strange to the adult reader accustomed to the traditional method, but Professor Thorndike is no doubt right in declaring it more in accord with the child's needs in his use of the book.

As would be expected, the word list of the dictionary includes most of the 20,000 words which appear in Professor Thorndike's well-known Word Book. The frequencies from the Word Book appear inconspicuously after the different entries. There are, however, about

5000 additional words gleaned from other sources. Since the average *adult* vocabulary is considerably less than 25,000 words, this total should give an ample vocabulary for the use of grade schools, and the basis should be a sounder one than the usual arbitrary choice of dictionary-makers.

In other respects, the Thorndike-Century Junior Dictionary has the usual helps provided by such books. The pronunciation key is that used by the Century Dictionary. Syllable division is shown by a very slight spacing rather than by a hyphen so as to maintain as far as possible the normal appearance of the word. The type face, and general make-up of the page is unusually clear and attractive. The drawings, of which there are over 1600, seem to serve excellently the purpose of showing meaning. All in all, the book seems most attractive and helpful to the elementary pupil, and should secure the interest in the dictionary and the habit of using it that are so important. Professor Thorndike is to be congratulated on this outcome of his years of work in this field.

E. W. Dolch
University of Illinois

Frank S. Freeman. *Individual Differences.* The nature and causes of variations in intelligence and special abilities. New York, Henry Holt & Co. 1934, pp. xi, 355.

The problems of the differences in so-called intelligence between various individuals is an important one. For a quarter of a century there has been an almost unceasing stream of papers on this topic. From these Dr. Freeman has selected with insight, organized his material about several foci, and interpreted without bias.

The two introductory chapters give the reader a background of the history of the idea of individual differences, and of the general nature of the distribution of such differences. Chapters three and four present data on the influence of heredity and environment on individual differences. Here the conclusions are expressed in two theories. First, "the extent and form of mental development are dependent in part upon conditions or factors of the individual's environments during his developmental period, particularly during the years of infancy and childhood; that there is an optimum period for the stimulation and development of innate mental potentialities, the development of which may be frustrated or aborted by very unfavorable or intellectually impoverished environments." Second, "that since the bulk of the population vary within a relatively nar-

row range in mental capacity, the manifested differences in measured ability must be due very largely to the opportunities of education and training."

Race and nationality differences in abilities have been demonstrated but no final case has been made that such differences are due to innate differences. There are probably no significant differences between the sexes in terms of average performance, although the evidence does seem to indicate that "the male sex is more variable at the extremes." In respect to age differences "the best evidence indicates the presence of individual differences in rate and character of mental growth quite early in infancy." For the age period from six years to seventeen years growth is also "regular and continuous," with the rate beginning to decrease around age ten or eleven. This slower rate of growth continues throughout adolescence, but growth does not "cease entirely before the age of 18 or perhaps 20."

Special abilities and disabilities are considered in Chapter IX. Of the five abilities discussed—arithmetic, reading, mechanical drawing, music—only the last two appear "to have a legitimate claim to being in the nature of special abilities."

Throughout the text there are some 350 footnote references to literature, many containing several citations. In addition there is a supplementary bibliography of nine pages. This is sufficient evidence that the literature has been carefully covered, and therefore the book should prove a valuable source work for all future studies.

C. M. Louttit
Indiana University

Blackhurst, J. H. *Humanized Geometry.* Published by the author, Drake University, Des Moines. 1934, pp. 206.

This book has for its aim "to utilize geometry as a resource in exposing and studying the process of thinking." To this end a discussion of the thinking processes as they are exposed is interwoven with the other textual material throughout the book, as are also brief historical treatments of various topics as they occur. The interest of the book for a student with a bent for psychological applications lies then in the fact that, while rejecting the efficacy of faculty discipline—"a strengthening of faculties as such through mere exercise"—it essays the task of making thinking effective in other than geometrical situations by generalizing the processes of thought to apply to every day life problems.

That faculty psychology is still alive in educational practice if not

in the language of educators requires no extended argument. The preface of a recent conventional textbook in geometry states that one of the major aims of the teaching and study of geometry is to produce "rational human beings." Shades of Freud and Thorndike!—But the reviewer withstands the temptation to expatiate on one of his most firmly (irrationally?) held prejudices anent the rationality of human beings in general, and of the effect of the study of geometry by the average student on his rationality in particular.

To find a book that tilts at these sturdy ghosts of a presumably dead psychology is refreshing. While—to remain in Dr. Blackhurst's context—one should not establish the value of the book by deductive reasoning, it is heartening to find that the author has also applied the inductive method of thinking by experimental evaluation of the study of this textbook, from which he finds that the prospective intellectual heirs of Euclid "learn with pleasure the few facts of geometry which are now being taught. In addition they learn much about the processes by which effective thinking is done and show genuine progress in the development of a generally critical attitude towards what they see and hear." If these results accrued in only very moderate degree, they would amply justify the book. It is here suggested to doubters who are in a position to do so that a few additional controlled experiments in educational psychology with this textbook and one or more others as the experimental variables will doubtless be welcomed by the author of the book here under review.

A few of the other features of the book which deserve mention may be briefly touched upon. The first dozen or so propositions are labeled as to whether the nature of the proof is inductive or deductive. There is no long introductory series of definitions and axioms—they are brought in as needed. A decent respect for the principles of learning and forgetting is shown by review exercises and by tests which comprise a part of the text throughout. Formal logical principles (Aristotelian) are occasionally brought to bear, often with diagrams, upon the proofs.

Obviously, such a book as this need not concern itself greatly with exhaustive inclusiveness of all that is contained in the conventional geometry textbook. Its primary concern is not with geometry, but with thinking, to an analysis of which geometry conveniently lends itself. To have included enough for this purpose is sufficient.

The book is typographically pleasing. It lacks a table of contents, but contains an index.

H. H. Remmers
Purdue University

Zeitschrift, fur Experimentelle Phonetik, edited by E. W. Scripture, Vol. I, Nos. 1 and 2, October 1930, July 1931.

This journal is the organ of the International Society for Experimental Phonetics and is quite technical. Some of the articles will be mentioned briefly.

Janvrin of London writes on methods of recording speech, with principle emphasis on pneumatic methods. Saksena of Allahabad gives a detailed phonetic analysis of a sentence in Hindu. Microscopic analysis was made of a graphic record. Scripture has an article on the nature of vocality which goes into trigonometric functions and Fourier's series. Janvrin writes again on phonetic records of patients with ataxia and also on the speech of epileptics. Scripture gives a somewhat psychological discussion of the speech process from the unconscious of the speaker to the unconscious of the listener. He uses electric analogies more complicated than the ordinary ones, including transformers, inductance, capacity and resistance in his circuits. Perhaps the most interesting article to the non-phonetician is that by Parmenter, Trevino and Bevan on x-ray records of the speech organs. The technique involves partially swallowing a gold chain, placing a strip of lead foil along the upper part of the oral cavity and elaborate devices for controlling the position of the head. The journal is quite specialized and should appeal to such psychologists as have gone rather extensively into phonetics.

HAROLD E. BURTT
Ohio State University

Künkel, Fritz. *Charakter Leiden und Heilung*, Hirzel, Leipzig, 1934, VIII-235.

The present work is the fifth in a series of six which give a broad treatment of character in the sense of the totality of the individual's types of conduct. Previous volumes deal with introductory material, with growth in education, with love and marriage, with individual and group aspects and the volume that follows the present one is to deal with work and social implications.

The present work is divided into three parts, dealing respectively with remedial character training, character pathology, and character therapy. The first section was the most interesting to the reviewer because it was the most concrete. There is some discussion of the role of the kindergarten, the effectiveness of a sympathetic teacher, the value of group activity and games, the possibility of working through relatives and parents, the importance of individual treat-

ment and the possibilities of rather subtle suggestion in handling a-social cases. The second section hints that study of pathological cases will throw light on most of the problems of normal psychology. An interesting term is coined, namely, "psychosclerosis," referring to stereotyped or automatic kinds of response. There is much emphasis on disturbances in the "we-relation" and the "it-relation." Most of the conventional disorders are enumerated, such as anxiety neuroses, functional neuroses, phobias and various psychoses, such as melancholia and schizophrenia. The ground covered here is conventional. However, the discussion is rather abstract, and could be made more interesting by more illustrative material. The final section deals with therapy. A somewhat original aspect deals with grouping patients together so that the total effect may be helpful to all concerned. While the author is in general sympathetic with the Freudian work, he does speak of "analysitis." Suggestion is included as a therapeutic measure. The work closes with a discussion of the "Reifende Wir" which apparently involves cooperation in activities of the group and may reflect implicitly the current political situation.

It is a bit difficult to place the book satisfactorily with reference to the psychology which is current today. It contains a good deal of emphasis on "I–we" relationships, "I–you," and also "I–it" relationships. The discussion often gets metaphysical and even inscrutable. To the reviewer it evokes an attitude slightly similar to that brought out when reading works of Emanuel Kant. It will not have much appeal to experimental psychologists or even to those in the clinical field, with the exception that the early portions of the book do give some concrete case studies which may embody a few original points.

HAROLD E. BURTT
Ohio State University

J. R. Kantor. *A Survey of the Science of Psychology.* Bloomington, Ind.: Principia Press. 1933. 564 p.

The history of psychology for nearly half a century shows a constantly increasing struggle for objectivity. Twenty years ago a school of psychology waxed strong and contributed much to experimental methodology and something to theoretical concepts. Today, behaviorism is being seen in clearer perspective as a physiology gone psychic. However, the failure of behaviorism, and certain other attempts, to develop an objective psychology as a science in its own right, and not confused with physiology, does not mean that such a desideratum is impossible of achievement.

Perhaps instead of searching for objectivity by attempting to explain its phenomena in physiological terms, psychology could find more value in treating its own data in its own objective terms. At the simplest level this means careful description of observed behavior from which may be formulated further working hypotheses, such hypotheses carefully avoiding either physiological or mentalistic implications.

That it is not impossible to do this Kantor has amply demonstrated in his *Principles of Psychology* published about ten years ago. The present *Survey* is not a condensation of the older two-volume work, but a new explanation of his interactional psychology reformulated and much clarified.

The book aims "to lay before the college student or general reader the materials of psychology not as firmly settled facts and principles, but as problems to be faced and worked over." This does not mean a "hodge-podge of indiscriminate views," for the student may be allowed the guidance of a viewpoint.

In the viewpoint of this book lies its greatest importance. Perhaps this can be best exhibited in the author's own words.

"It may be well to state some of the assumptions of the organismic viewpoint. One of the first is that psychology has its own subject-matter and is not a patchwork of physiology and philosophy as so many writers seem to believe. Organismic psychology holds that psychological phenomena are very specific interactions between organisms and stimulating objects.

"The interaction view, it is submitted, allows the student to look upon psychological phenomena (remembering, reasoning, etc.,) as objective, natural happenings. On the other hand, the psychologist is relieved from the necessity of reducing his data to actual or hypothetical, neural or general biological events—or worse still, inventing physiological facts to explain psychological phenomena. To do either results in a serious misinterpretation of psychological data."

In the limited space available for this review, one can do no more than suggest the contents of the text. Following the introduction chapter, six chapters are devoted to the reactional biography and its development to the final culmination in a psychological personality. Attending, perceiving, knowledge, feeling, emotion, remembering, learning, language, thinking, volition and imagination are all treated as different aspects and types of interactions. The last six chapters consider the biological and anthropological matrices of human be-

havior. Forty-five pages of selected references form one of the best reading lists thus far suggested for elementary psychology.

C. M. LOUTTIT
Indiana University

The Biology of the Individual. An Investigation of the Most Recent Advances. Association for Research in Nervous and Mental Diseases. Volume XIV of a Series of Research Publications. Baltimore, Williams and Wilkins. 1934. XV. 323 p.

This volume comprises the Proceedings of the fourteenth annual meeting of the Association edited by Drs. J. Ramsay Hunt, Thomas K. Davis and Angus M. Frantz. The theme of this meeting was "the concept of totality which we recognize by such expressions as individuality and personality." Eighteen papers, by as many authors, are presented covering various aspects of "constitution"—anatomical, endocrinological, medical, psychiatric, and psychological.

If the papers here presented were intended to elucidate the problem of individuality from different points of view to the end of offering at least a beginning of integration in this divergent field, then they fall short of the goal. But perhaps such an end cannot be achieved in this manner; perhaps critical integration can be brought about only by the work of one or two men, broad enough to appreciate the many aspects and unbiased enough to find its niche for each of the many data now recorded.

On the other hand, if we consider the book as a collection of papers presented at a scientific meeting, there is much good in it. Twelve of the papers are either reviews or theoretical essays in their respective fields, five are reports of experiments, apparently here made for the first time, and one is chiefly an essay with a discussion of preliminary data of an investigation in progress.

In the first group of papers, as divided above by the reviewer, Jelliffe has some historical notes on the concepts of constitution and individuality; Davenport reviews the evidence on the inheritance of body-build; Gesell summarizes the ontogenetic patterning of infant behavior; L. F. Barker shows how constitutional types have been and might be used in clinical medicine; Walter Timme has an excellent systematic summary of the physical and mental changes following endocrine dysfunction; illustrated with twenty-two photographs; Max A. Goldzieher considers the biochemical aspects, especially non-endocrine; Klüver reviews the problems of the eidetic type; and the last papers classed as a review is that by

William Healy concerned with the causes of delinquency and crime.

The five papers which I have called theoretical essays—largely because they are classifiable neither as reviews nor as experimental reports—included Eugene Kahn on the constitutional aspects of personality types; C. Macfie Campbell on personality and the psychoses; Paul Shilder on personality in the light of psychoanalysis (and not strictly Freudian); and Oskar Diethelm on the personality concept in relation to graphology and the Rorschach test. Floyd Allport writes on individuals and their human environments and includes a preliminary report on an investigation of the distribution of behavior contacts.

The five remaining papers are experimental reports. William T. James gives a preliminary report of work done at the Cornell Experimental Anatomy Farm on the variations in the establishment of a salivary conditioned reflex among different breeds of dogs. The results suggest that an extensive continuation of the study may afford bases for conclusions as to the relation of behavior and form.

T. Wingate Todd reports some results on the extensive investigations he is supervising on physical and mental development in childhood. His findings indicate the importance of roentgenographic studies of the epiphysical changes as a means of measuring physical maturity as distinct from physical growth.

Karl M. Bowman has developed a schedule of traits for studying pre-psychotic personality. Data secured by means of this schedule from 322 psychotics, chiefly schizophrenics and affective psychoses, and 96 normal controls indicate that a method such as this offers what promises to be a useful clinical and research tool.

R. G. Hoskins and E. M. Jellinek have analysed test performances and physiological measurements made on a group of 92 schizophrenics. Their data are of great psychological and physiological interest, but they are so extensive we can do no more than pick one sentence that appears to be at least a partial summary. They say that "schizophrenia is characterized by sluggish sympathetic reactivity."

George W. Henry recorded data on the skeleton, arm angle, fat, musculature, hair, voice, and genitalia of 123 men and 105 women psychotic patients. From psychosexual and social histories of the patients he was able to separate three distinct groups: 15 heterosexuals, 33 homosexuals and 35 narcissists. Comparisons of the average measurements of the three groups showed some rather consistent differences. The constitutional deviations of the homosexual and

narcissistic patients suggest inadequacies at the physiological level of integration.

To adequately review a collection of papers such as this each one must be treated separately, and this space limitation will not allow. However, one word may be said for the collection as a whole—it will be an invaluable reference for collateral work in physiological, experimental and abnormal psychology.

C. M. Louttit
Indiana University

A STUDY OF THE NEEDS OF ADULTS FOR FURTHER TRAINING

(Continued from page 861)

"The most serious danger in establishing guidance clinics is that those who direct them may not be as competent as they should be. In making a vocational diagnosis and training recommendations, one must see not only the individual as a whole but also the significance of each of his different skills, occupational experiences, abilities, interests, attitudes, and personality traits. Six hours or more of an average individual's time may be required to enable a clinic to express an opinion about the appropriateness or inappropriateness of any given line of work. Vocational fitness is not a simple matter that can be quickly determined by asking a few questions or by giving a few tests. It is an extremely complex problem, involving the interrelationships of many different human traits, some of which cannot yet be measured with sufficient validity and reliability to permit prediction of success by means of a formula.

"An enormous amount of research remains to be done on the characteristics that are typical of successful workers in various occupations and the relationships that exist between the characteristics that can be measured. The clinical approach of the trained occupational psychologist is absolutely necessary in the present stage of development in this field, but the possibilities of saving wasted efforts and of avoiding human disappointments and frustrations in training are already large. The experiences of the Occupational Analysis Clinic of the Employment Stabilization Research Institute indicate that even now great service can be rendered along these lines if the value of such service is recognized. As the basic research results accumulate, the possibilities of reducing the unhappiness resulting from misdirected occupational and educational efforts will be increased."

NEW BOOKS AND PAMPHLETS RECEIVED

Books and pamphlets for review should be sent to James P. Porter, Editor, Journal of Applied Psychology, Ohio University, Athens, Ohio.

Acta Psychologica. G. Revesz, Editor, Amsterdam, Holland. 16 pp.

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Australian Council for Educational Research. Fourth Annual Report, 1933-34. 145 Collins Street, Melbourne, Victoria, Australia. 30 pp.

Beauty and Human Nature. Albert R. Chandler. D. Appleton-Century Company, New York, 1934. $3.50. 381 pp.

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The Relationship between the Ability to Recall and the Ability to Infer in Specific Learning Situations. Ralph C. Bedell. Bulletin No. 9, December, 1934. Northeast Missouri State Teachers College, Kirksville, Mo. 55 pp.

Religion in the Making. Alfred North Whitehead. Macmillan Company, New York, 1926. 160 pp.

Thorndike-Century Junior Dictionary. E. L. Thorndike. Scott, Foresman & Company, New York, 1934. $1.32. 970 pp.

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Psychological Abstracts—Eno Hall, Princeton, N. J. American Psychological Association. Subscription $6.00. 700 pages ann. Edited by W. S. Hunter. Monthly. Abstracts of psychological literature. Founded 1927.

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Child Development—Baltimore, Md.: Williams & Wilkins Company. Subscription $5.00. 400 pages annually. Edited by Buford Johnson. Quarterly. Founded 1930.

Character and Personality—Durham, N. C.: Duke University Press. Subscription $2.00 per annum. Quarterly. Edited by Robert Saudek (London) and Ernest Seeman (Durham, N. C.). Founded 1932.

The Psychological Exchange—11 East 125th Street, New York, N. Y. Subscription $3.00 per annum. Bi-monthly. Edited by James Hargan. Founded 1932.

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American Journal of Psychology—Ithaca, N. Y.: Cornell University. Subscription $6.50. 624 pages annually. Edited by M. F. Washburn, K. M. Dallenbach, M. Bentley, E. G. Boring. Quarterly. General and experimental psychology. Founded 1887.

Journal of General Psychology—Worcester, Mass.: Clark University Press. Subscription $14.00 per annum; $7.00 per volume. 1,000 pages annually (2 volumes). Edited by Carl Murchison and an international cooperating board. Quarterly. Experimental, theoretical, clinical, and historical psychology. Founded 1927.

Psychological Review—Princeton, N. J.: Psychological Review Company. Subscription $5.50. 540 pages annually. Bi-monthly. General Psychology. Edited by Howard C. Warren. Founded 1894.

Psychological Monograph—Princeton, N. J.: Psychological Review Company. Subscription $6.00 per vol. 500 pp. Ed. by Raymond Dodge. Published without fixed dates, each issue one or more researches. Founded 1895.

Psychological Index—Princeton, N. J.: Psychological Review Company. Subscription $4.00. 300-400 pp. Edited by W. S. Hunter. An annual bibliography of psychological literature. Founded 1895.

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Journal of Abnormal and Social Psychology—Eno Hall, Princeton, N. J. American Psychological Association. Subscription $5. Foreign, $5.25. Editor, Henry T. Moore. Quarterly. 448 pages annually. Abnormal and Social. Founded 1906.

Psychological Clinic—Philadelphia: Psychological Clinic Press. Subscription $3.00. 288 pages. Ed. by Lightner Witmer. Without fixed dates (9 numbers). Orthogenics, psychology, hygiene. Founded 1907.

Psychoanalytic Review—Washington, D. C.: 3617 10th St., N. W. Subscription $6. 500 pages annually. Psychoanalysis. Quarterly. Ed. by W. A. White and S. E. Jelliffe. Founded 1913.

Journal of Experimental Psychology—Princeton, N. J. Psychological Review Company. 500 pages annually. Experimental. Subscription $6.00. Bi-monthly. Edited by S. W. Fernberger. Founded 1916.

Journal of Applied Psychology—Crawfordsville, Ind.: R. R. Donnelley & Sons Co. Subscription $5.00. 600 pages annually. Bi-monthly. Edited by James P. Porter, Ohio University, Athens, Ohio. Founded 1917.

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